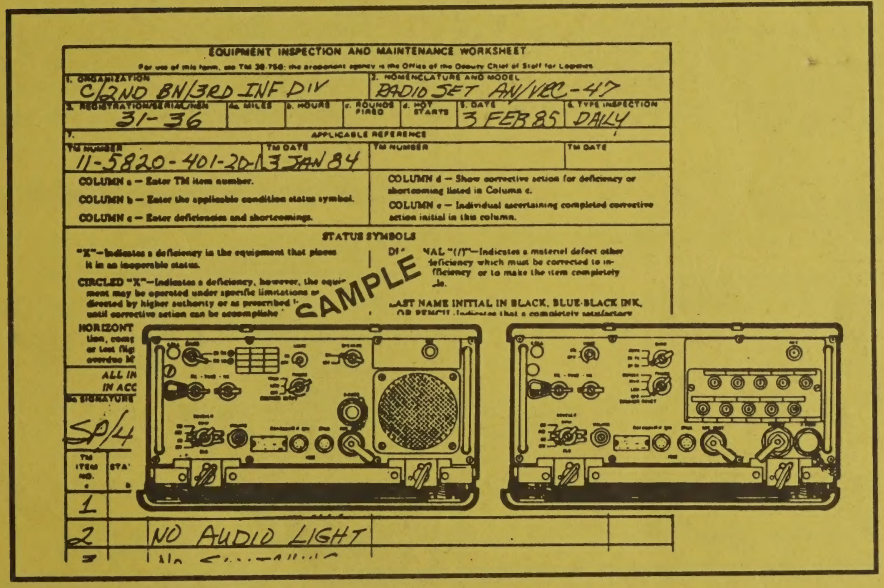
SUBCOURSE
FS 0725

EDITION
9

US ARMY SIGNAL SCHOOL

SYSTEM TROUBLESHOOT TO CORRECTIVE ACTION AN/VRC-12 SERIES RADIO SET WITH COMSEC EQUIPMENT, PART I


EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

1. ORGANIZATION: C/2ND BN/3RD INF DIV
2. NOMENCLATURE AND MODEL: RADIO SET AN/VRC-47
3. REGISTRATION/SERIAL NO.: 31-36
4. TYPE INSPECTION: DAILY
5. DATE: 3 FEB 85

APPLICABLE REFERENCE

TM NUMBER	TM DATE	TM NUMBER	TM DATE
11-5820-401-20-1	3 JAN 84		

COLUMN a – Enter TM item number.
COLUMN b – Enter the applicable condition status symbol.
COLUMN c – Enter deficiencies and shortcomings.
COLUMN d – Show corrective action for deficiency or shortcoming listed in Column c.
COLUMN e – Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X"–Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X"–Indicates a deficiency, however, the equipment may be operated under specific limitations or directed by higher authority or as prescribed until corrective action can be accomplished.

DIAGONAL "/"–Indicates a material defect other than deficiency which must be corrected to improve efficiency or to make the item completely serviceable.

SAMPLE

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, NO PENCIL. Indicates that a commodity satisfactorily

HORIZONTAL lines, cross or text flag overdue M

ALL IN IN ACC

SIGNATURE: SP/4

ITEM NO.	STA	
1		
2		NO AUDIO LIGHT
3		No [illegible]

27 JUN 85

DEVELOPMENT DATE: 30 SEP 1989

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ARMY CORRESPONDENCE COURSE PROGRAM

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- Address
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- Field Manual Procedure
- Doctrine
- Technical Manual Procedure
- Equipment Specification

INCORRECT REFERENCE OR EXTRACT

- Regulation
- Pamphlet
- Field Manual
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- Policy

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- Organization
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- Situation
- Illustration
- Chart
- Figure
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- Too High
- Too Low

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WRITE:

Use the **Student Administrative Inquiry Form** at the back of this subcourse.

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DIRECTIONS

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Use the **Student Subcourse Content Inquiry Form** at the back of this subcourse if you have inquiries about subcourse content.

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UNIT-LEVEL COMMUNICATIONS MAINTAINER
MOS 31V SKILL LEVEL 1

Author: Wm. Kitchen, ATSF-EED, AV 639-5868, Commercial (405) 351-5868, FTS 744-5868

SYSTEM TROUBLESHOOT TO CORRECTIVE ACTION AN/VRC-12 SERIES RADIO SET WITH COMSEC EQUIPMENT, PART I

SUBCOUSE FS 0725

US Army Signal School
Fort Gordon, Georgia

Fifteen Credit Hours

GENERAL

This subcourse is designed by the US Army Field Artillery School to train the skills necessary to system troubleshoot the AN/VRC-12 series radio set with communications security (COMSEC) equipment. This subcourse is presented in one lesson divided into five learning events supporting the following soldier's manual task:

TASK NO: 113-587-0047

TASK: System troubleshoot to corrective action AN/VRC-12 series radio set with COMSEC equipment.

CONDITIONS: This task is performed when an operator reports an equipment malfunction or as directed by your supervisor. You will be provided with the following:

1. AN/VRC-12 series radio set with TSEC/KY-57 COMSEC equipment installed in a tactical vehicle.
2. Distant operational compatible FM radio set with operator.
3. Electronic Transfer Device KYK-13/TSEC loaded and with fill cable.
4. Tool kit-101/G.
5. Multimeter AN/PSM-45.
6. Test set AN/PRM-34.
7. DA Form 2404 (completed by operator).
8. (0) TM 11-5810-256-OP-3, (0) TM 11-5810-312-12-2, TM 11-5820-401-20-1 and DA Pam 738-750.

STANDARDS: System troubleshoot and take corrective action, restoring the system to full mission capable status.

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Learning Event III: System Troubleshoot AN/VRC-12 Series Radio Set With COMSEC Equipment Receive Signal Path to a Defective Component, Cable, or Accessory

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EXAMINATION E-1

APPENDIX A-1

ADMINISTRATIVE INSTRUCTIONS

Subcourse content. This subcourse contains one lesson relating to one soldier's manual task for the unit-level communications maintainer (31V). This lesson will enable you to system troubleshoot the AN/VRC-12 series radio set with COMSEC equipment and take corrective action(s) necessary to restore the system to full mission-capable status.

Supplementary requirements. The following subcourse should be completed before taking this subcourse: SS0714 Organizational Maintenance for AN/VRC 12 Series Radios.

Prerequisites are based upon skill progression solely within the correspondence course curricula. Therefore, enrollees who have gained this knowledge from other materials may not need to complete the listed subcourse. If unable to complete this subcourse because of lack of prerequisite knowledge, request the prerequisite subcourse from:

Army Correspondence Course Program (ACCP)
US Army Training Support Center
Newport News, VA 23628-0001
Telephone: (804) 878-2079, AUTOVON: 927-2079

Materials needed. You will need a Number 2 pencil and paper (furnished by the student).

Supervisory assistance. There are no supervisory requirements for completion of this subcourse.

References. No supplementary references are needed for this subcourse.

GRADING AND CERTIFICATION INSTRUCTIONS

Instructions to the student. This subcourse has an examination that is a performance-based, multiple-choice test covering three learning events. You must score a minimum of 70 percent on this test to meet the objective of the subcourse.

Credit hours. Fifteen credit hours will be awarded for successful completion of this subcourse.

LESSON
SYSTEM TROUBLESHOOT TO CORRECTIVE ACTION AN/VRC-12 SERIES
RADIO SETS WITH COMSEC EQUIPMENT

OBJECTIVE

After completing this lesson, you will be able to system troubleshoot the AN/VRC-12 series radio sets with COMSEC equipment, and you will be able to do the required corrective action(s) to place the system back to a fully mission-capable status.

REFERENCES

This subcourse is based on TM-11-5820-401-20-1, (O) TM 11-5810-312-12-2, DA Pam 738-750, and other materials approved for US Army instruction; however, development and progress render the text continually subject to change. Therefore, base your examination answers on material presented in this subcourse rather than on individual or unit experience.

1. INTRODUCTION. When you observe abnormal operating indications, troubleshooting must be done to find the cause for the problem. For troubleshooting purposes, the AN/VRC-12 series radios with COMSEC equipment are divided into five basic circuits:

- Direct current (DC) power input circuit.
- Matching unit DC control circuit.
- RT-524/246 and R-442 receiver signal path circuit.
- RT-524/246 keying and muting circuit.
- RT-524/246 transmit signal path circuit.

After you have identified the defective circuit, you must select the appropriate diagram(s) and then trace that circuit to identify the circuit components, cables, and accessories. To be successful in circuit analysis, you must know how these different circuits affect the operation of the radio set.

LEARNING EVENT I

System Troubleshoot AN/VRC-12 Series Radio Sets With COMSEC equipment DC Power Input and Power Distribution Circuits to the Required Corrective Action(s)

2. POWER INPUT CIRCUIT TO THE AN/VRC-12 SERIES RADIOS WITH COMSEC EQUIPMENT. The first circuit you are going to study is the power input circuit to the AN/VRC-12 series radios. To troubleshoot the AN/VRC-12 series radio sets with COMSEC equipment DC power input circuit, you must know what items of equipment are being used and how they are connected to get the source voltage from the

vehicle batteries to the radio system components. You must then know where this circuit can be disconnected and what test points to use to make voltage and continuity checks. You must also know which measurements are good and which measurements are bad.

3. AN/VRC-12 SERIES RADIO SETS WITH COMSEC EQUIPMENT DC POWER INPUT VOLTAGE. The AN/VRC-12 series radio sets DC power input voltage circuit provides the required source voltage from the vehicle electrical system through power cable CX-4720 to mount MT-1029. The mount then distributes DC voltage to the receiver-transmitter (RT) unit and other components of the radio set. An additional radio component can be operated in either a direct or remote power input mode.

a. The power input circuit starts at the two 12-volt (v) vehicle batteries that are connected in series. (See Figure 1.)

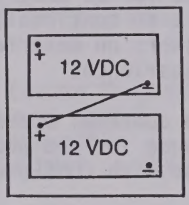


Figure 1. Two 12-volt vehicle batteries connected in series (source voltage).

b. From the source, a voltage of 22 to 30 volts DC is applied through the power cable CX-4720 to Pin A (negative) and Pin B (positive) of the cable plug P21. (See Figure 2.)

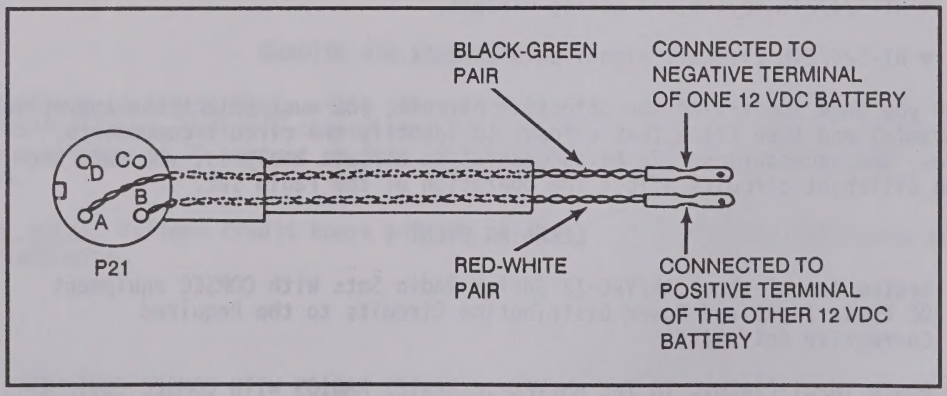


Figure 2. CX-4720 power cable.

4. MOUNT MT-1029. In the mount MT-1029, Pin A of jack J21 is wired directly to Pins A of J22, J23, and J24, providing these pins with a ground connection. The positive (+) 24 volts DC (VDC) is applied from Pin B of J21 through E21 on the terminal board TB21 and through the 100-amp fuse F11 to E24 on TB21. (See Figure 3.)

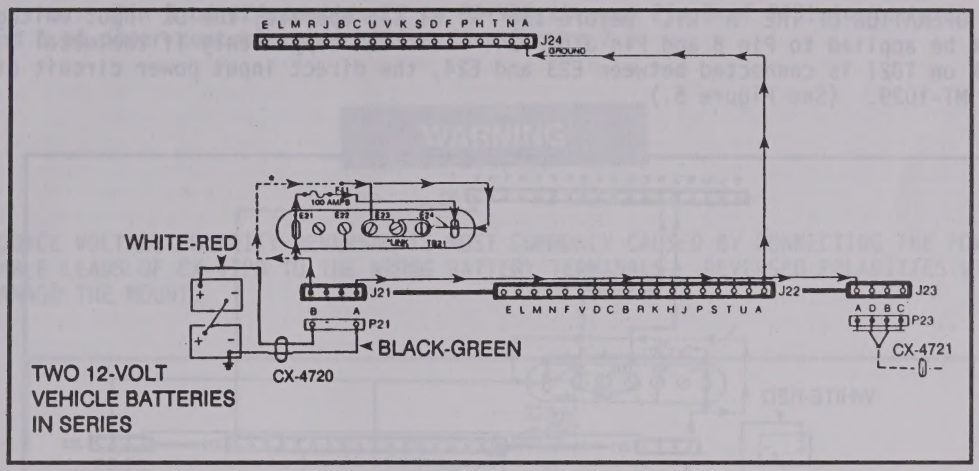


Figure 3. MT-1029 ground path Pin A of J21 to J22, J23, and J24. +24 VDC path from Pin B of J21 to E24.

NOTE: E21 and F11 appear only in mounts produced before 1972. In mounts produced after 1972, Pin B of J21 is wired directly to E24 as shown by the dashed line in Figure 3.

In the mount MT-1029, the positive 22 to 30 VDC at E24 is applied to Pin B of jacks J22, J23, and J24. (See Figure 4.)

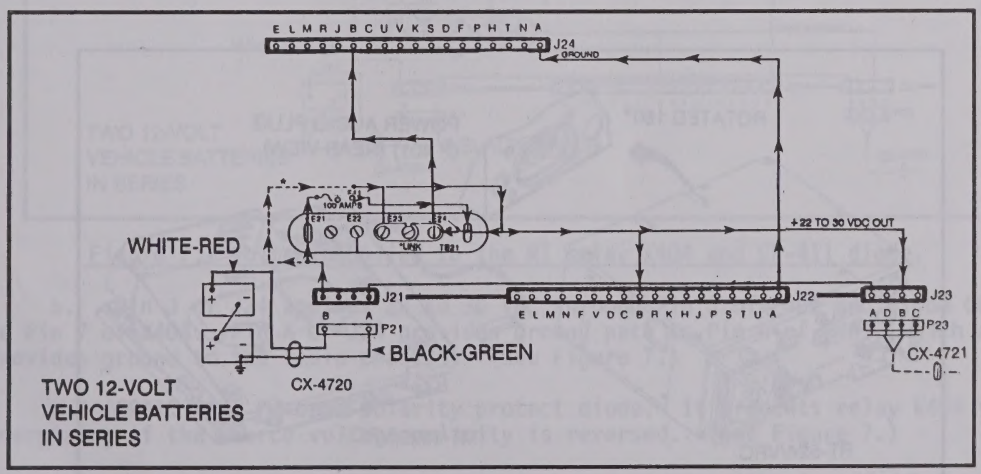


Figure 4. MT-1029 22 to 30 VDC paths from E24 to Pin B of J22, J23, and J24.

5. OPERATION OF THE "A" RT. Before the "A" RT can operate, the DC input voltage must be applied to Pin B and Pin J of J24. This can happen only if the metal link on TB21 is connected between E23 and E24, the direct input power circuit of the MT-1029. (See Figure 5.)

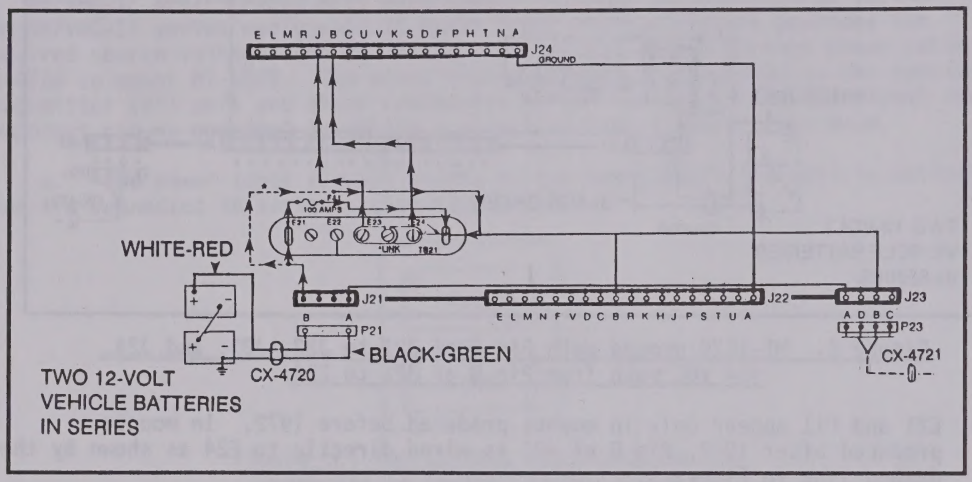


Figure 5. "A" RT 22 to 30 VDC to Pin J of J24 through mount link from E24.

When the "A" RT is in its mount, plug P401 on the back of the RT connects with J24 on the mount. The DC input voltage is then applied to the RT. (See Figure 6.)

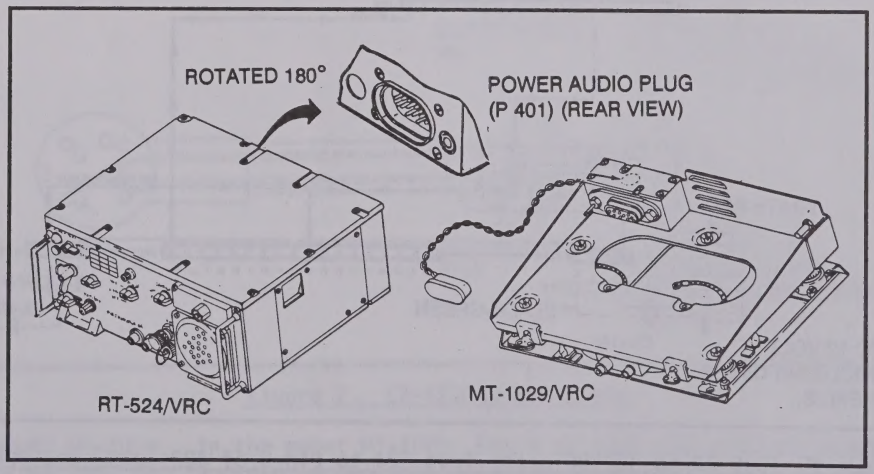


Figure 6. "A" RT with mount and plug P401.

a. Pin B of J24 applies 22 to 30 VDC through Pin B of P401 to Contacts 4 and 5 of power control relay K404. (See Figure 7.)

WARNING

SOURCE VOLTAGE POLARITY REVERSAL IS MOST COMMONLY CAUSED BY CONNECTING THE POWER CABLE LEADS OF CX-4720 TO THE WRONG BATTERY TERMINALS. REVERSED POLARITIES WILL DAMAGE THE MOUNT.

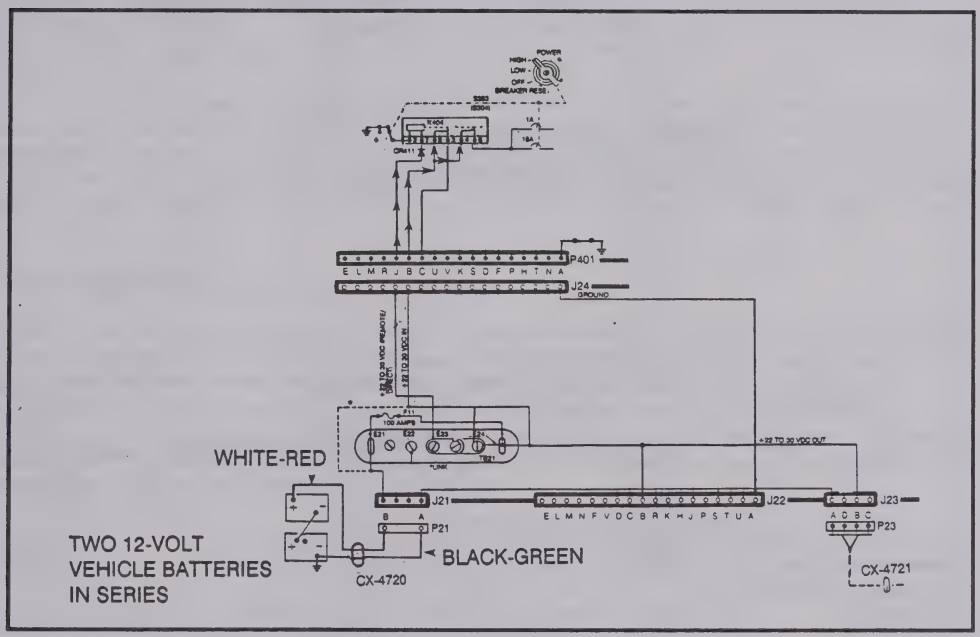


Figure 7. Voltage applied to the RT relay K404 and CR-411 diode.

b. Pin J of J24 applies 22 to 30 VDC through Pin J of P401 and diode CR411 to Pin 7 of K404. Pin A of J24 provides ground path to Pin A of P401, which also provides ground to the radio chassis. (See Figure 7.)

c. CR411 is a reverse-polarity protect diode. It prevents relay K404 from energizing if the source voltage polarity is reversed. (See Figure 7.)

d. When the polarity is correct and the RT POWER switch is off, the negative side of the source (ground) to the relay coils, Pin 2, is not completed. To energize the power control relay; that is, to turn K404 on, a path to ground at Pin 2 must be completed. This is made through the contacts of the RT POWER switch. (See Figure 7.)

e. When the POWER switch of an RT is turned to LOW or HIGH, the ground path to K404 Pin 2 is completed, causing it to energize (see Figure 8). As relay K404 energizes, Contact 3 will move to mate with Contact 5 and Contact 6 will move to mate with Contact 4. For as long as the RT POWER switch remains at either LOW or HIGH, the power control relay K404 will remain energized.

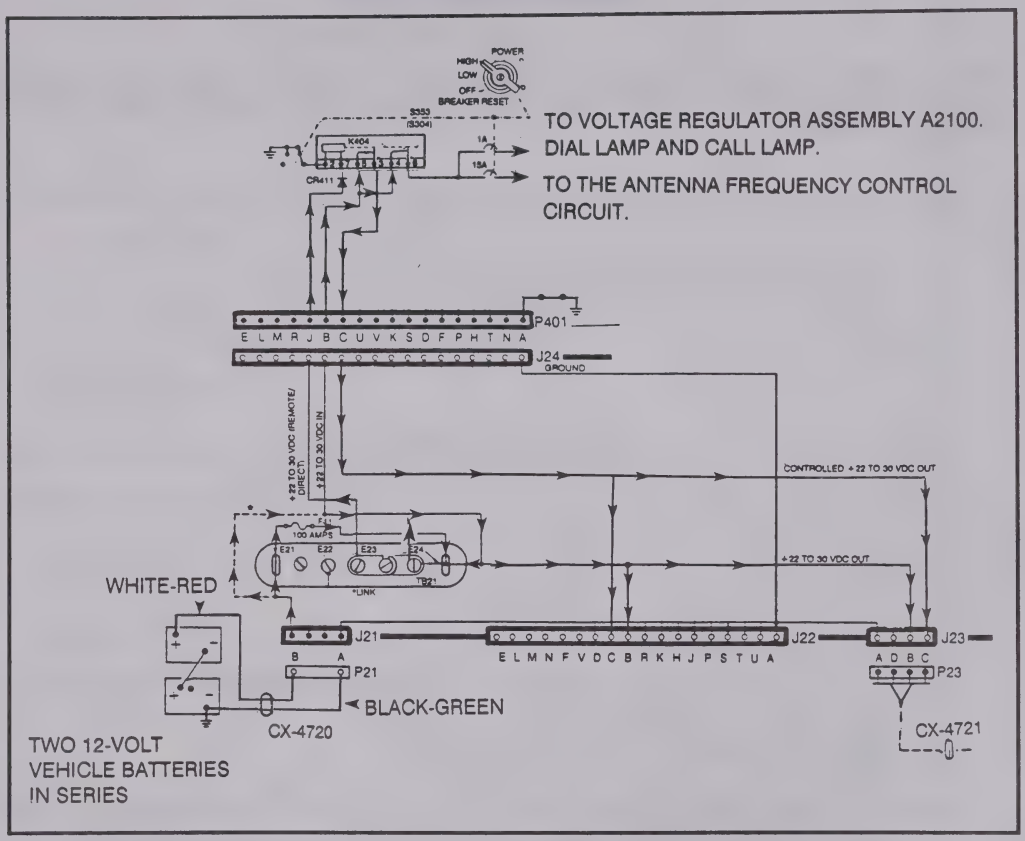


Figure 8. "A" RT with POWER switch ON and K404 energized and voltage applied to Pin C of M-1029 through K404.

(1) Contact 6 will mate with Contact 4 to apply source voltage through a 1-amp circuit breaker, then through the RT light switch, then on to light the RT dial window lamp. Additionally, with Contact 6 mating with Contact 4, source voltage is applied to the power supply of the RT, A2100, and the CALL lamp of the RT. The power supply will provide an operating voltage of +16 VDC to the internal circuits of the RT. Source voltage also is applied through a 15-amp circuit breaker to the antenna-frequency-control circuit of the RT. (See Figure 8.)

(2) The 1-amp and 15-amp circuit breakers are mechanically connected to the POWER switch of the RT. This means that both circuit breakers will be turned on as the POWER switch of the RT is turned to LOW or HIGH and should remain on as long as the POWER switch remains on. You should recall that a circuit breaker provides overload protection. That is, if the circuit that a circuit breaker is supplying overloads (draws excessive current), the circuit breaker will automatically trip off to prevent damage to the supplying circuit--in this case, the electrical system of the vehicles and the source-voltage input circuit of the RT. Although both circuit breakers come on together as the POWER switch of the RT is turned to LOW or HIGH, they will independently trip off depending on where an overload occurs. To reset a tripped circuit breaker, turn the POWER switch of the RT to OFF-BREAKER-RESET, wait 30 to 60 seconds to allow the overloaded circuit to cool, and then return the POWER switch to LOW or HIGH as before. If the RT stays on, continue to operate. If it again trips off, further troubleshooting is required. This troubleshooting will be covered later in this text. (See Figure 8.)

(3) At the same time that K404 Contact 6 mates with Contact 4, Contact 3 mates with Contact 5 to apply the positive side of the source voltage back through Pin C of P401 and J24, through a wire inside the junction box to Pin C of both J22 and J23. This controlled leg of the power input circuit will be used to remotely control power to an additional RT of an A-RT or an R-442. (See Figure 8.)

PRACTICE EXERCISES:

Complete the following exercises by circling T for true or F for false, circling the letter preceding the correct answer, or by filling in the blanks, as appropriate. Be sure to complete the practice exercises as they appear. They are "building blocks" and will help you complete the rest of the subcourse successfully. The answers follow the last exercise and are separated by rows of slashes (/////). If any of your answers are incorrect, restudy the appropriate part of the subcourse before you continue.

1. T F The controlled leg of the power input circuit is used to remotely control input power to additional radio components.

2. The source voltage for an AN/VRC-12 series radio is--

   a. 20 to 30 VDC.
   b. 22 to 30 VDC.
   c. 30 to 40 VDC.
   d. 110 to 115 VAC.

3. For the two 12 VDC batteries in a vehicle to provide the correct source voltage to an AN/VRC-12 series radio set, they must be connected in--

   a. parallel.
   b. series parallel.
   c. series.
   d. series complex.

4. The positive 22 to 30 VDC from the vehicle batteries is applied to which pin of the P21 CX-4720 power cable?

   a. Pin A
   b. Pin B
   c. Pin C
   d. Pin D

5. In the mount MT-1029, which Pin on J21, J22, J23, and J24 is ground?

   a. Pin A
   b. Pin B
   c. Pin C
   d. Pin D

//

ANSWERS:

1. T
2. b.
3. c.
4. b.
5. a.

//

6. ADDITIONAL RADIO COMPONENT. When an AN/VRC-12 series radio includes an additional radio component such as receiver R-442, this additional radio also must have DC power to operate. For the eight AN/VRC-12 series radios, six of them use additional radio components (one of them, as an example, is the AN/VRC-47). (See Figure 9.)

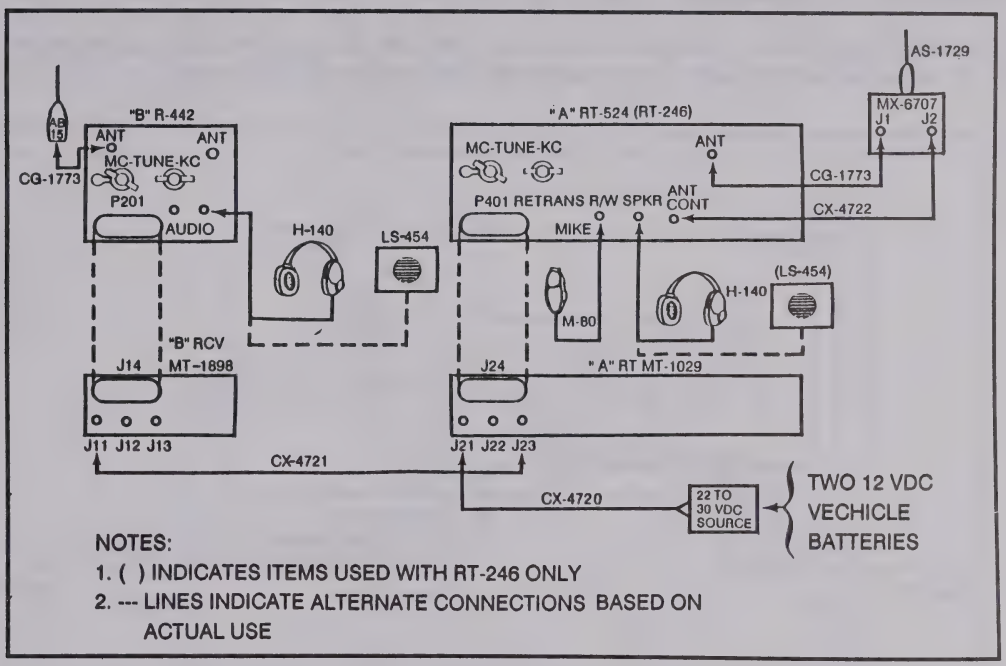


Figure 9. AN/VRC-47, one of eight AN/VRC-12 series radio configurations.

a. When receiver R-442 is used with an RT-524 or RT-246, it is identified as the B receiver. It is connected to the mount of the "A" RT J23 by using power cable CX-4721. The mount of the "A" RT provides DC power input voltage through cable CX-4721 to the R-442 mount MT-1898. (See Figure 9.)

b. When using an additional radio component with the "A" RT, the additional component can be operated in two different power modes, either direct power or remote power. The mode of operation of the additional radio component is controlled by the positioning of the link of the mount MT-1898. First, let us look at how the DC voltage is applied to an R-442 in the DIRECT MODE.

c. When an additional radio component mount link position is set up for direct power operation, the link in the radio mount MT-1898 when using an R-442, will be positioned between E13 and E14. This allows the R-442 to get its power directly from the vehicle batteries. Therefore, the additional radio component can be operated even though the RT is turned off, or even if the RT is removed from its mount. The source voltage for the R-442 is applied at Pin B of plug P11 of the CX-4721 power cable. (See Figure 10.)

NOTE: E14 applies DC voltage to Pin B of jack J13 to apply input power to still another additional radio component such as C receiver R-442.

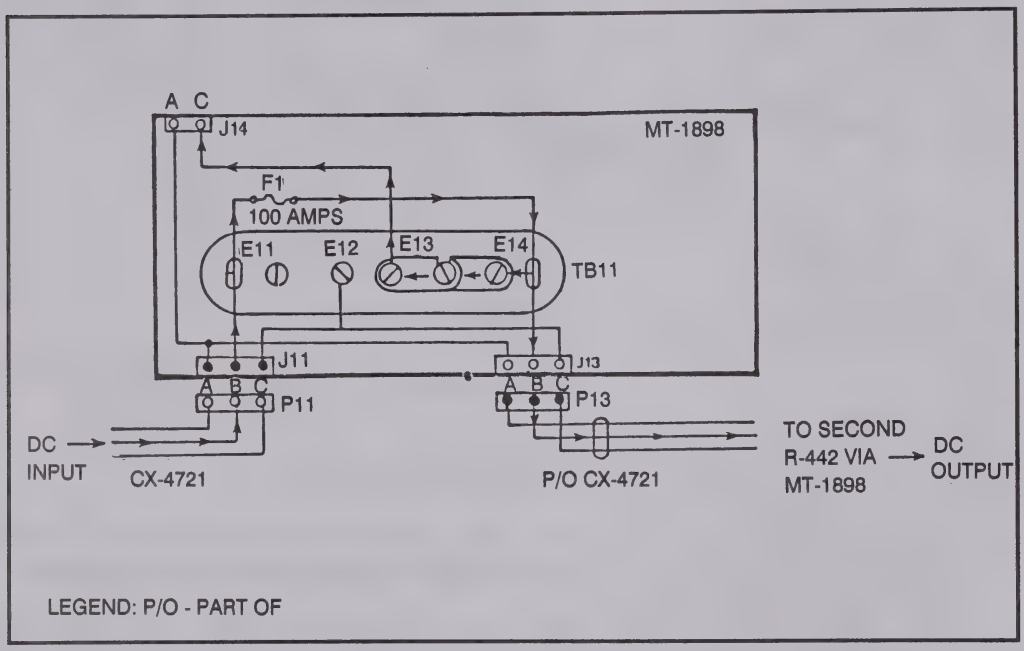


Figure 10. MT-1898 mount with link set for direct DC input voltage distribution.

d. Normally, the mounts for the additional radio components are set up for remote power operation. That is, the link in the mount of the additional radio component is positioned between E12 and E13 on the terminal board in the junction box of the mount; for example, the MT-1898 mount for the B receiver (see Figure 11). In this mode, remote, input power is provided through the "A" RT, so the "A" RT must be in its mount and the RT POWER switch set at either LOW or HIGH for the additional radio component to operate. Remember that the source voltage is now applied at Pin C of the P11 plug on the CX-4721 power cable. This is a controlled +24 VDC that is applied by Contact 3 mating with Contact 5 of relay K404 inside the "A" RT. This voltage is now applied through jack J11 Pin C to E12 of TB11 and E13 of TB11 to Pin C of J14. (See Figure 11.)

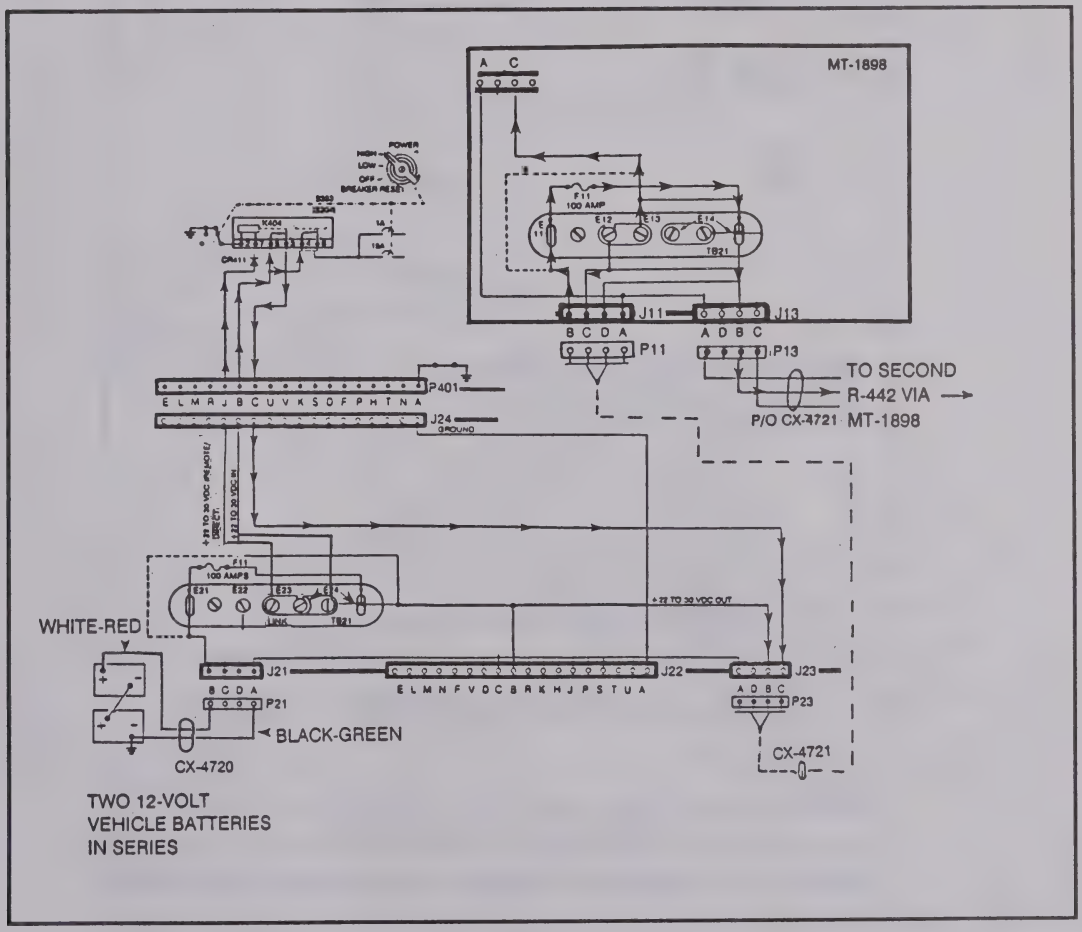


Figure 11. B receiver mount MT-1898 with link shown in remote DC voltage distribution.

7. POWER DISTRIBUTION OF R-442. The +22 to 30 volts DC voltage input from Pin C of plug P201 on the R-442 is applied through the reverse-polarity-protect diode CR101 and circuit breaker CB101 POWER switch to the voltage regulator assembly A2100. When the R-442 LIGHT switch is set to ON, DC input voltage is applied to the DIAL lamp and to the CALL lamp. (See Figure 12.)

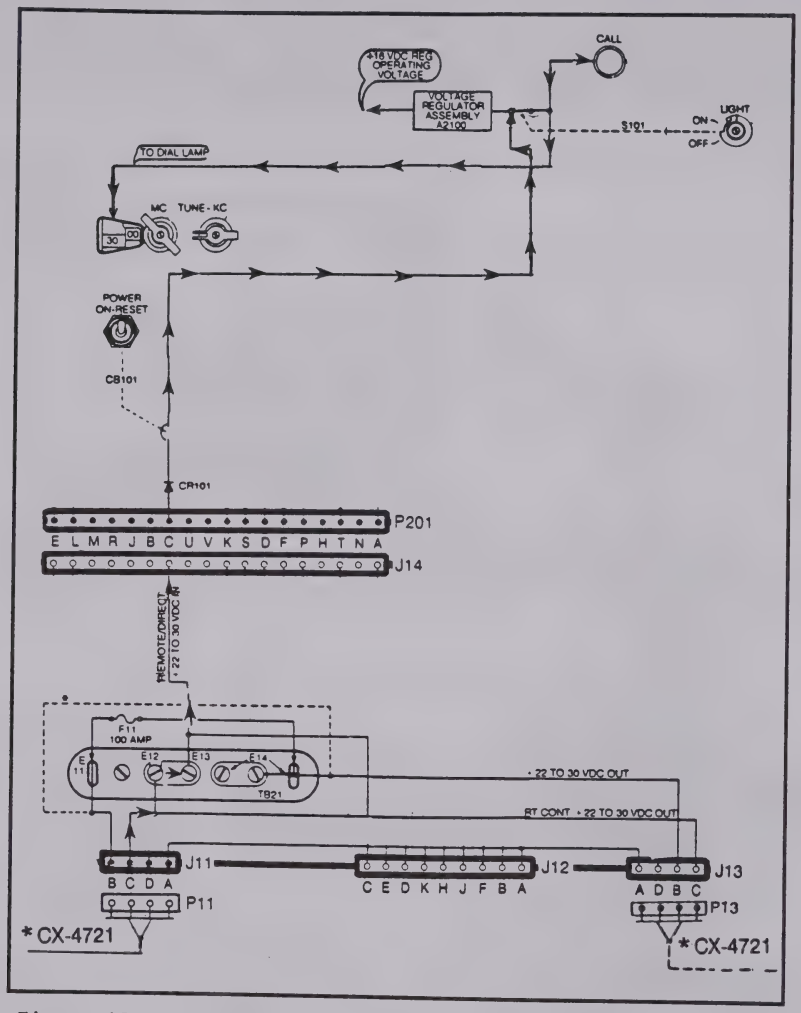


Figure 12. DC power application to B receiver (REMOTE MODE).

8. FREQUENCY SELECTOR CONTROL BOX C-2742. If the radio being checked is an RT-246/VRC, its installation kit will contain a frequency selector control box C-2742, which is used to extend the control of power and the selection of preset frequency channels to a remote location within the vehicle. A frequency selector switch is located on the face of the control box. (See Figure 13.)

a. The power switch (located on the right) allows control of power to the complete radio set and a selection of high or low transmitter output. The SW switch (located on the left) when pushed to the rear and then released permits control of the receiver-transmitter at the C-2742.

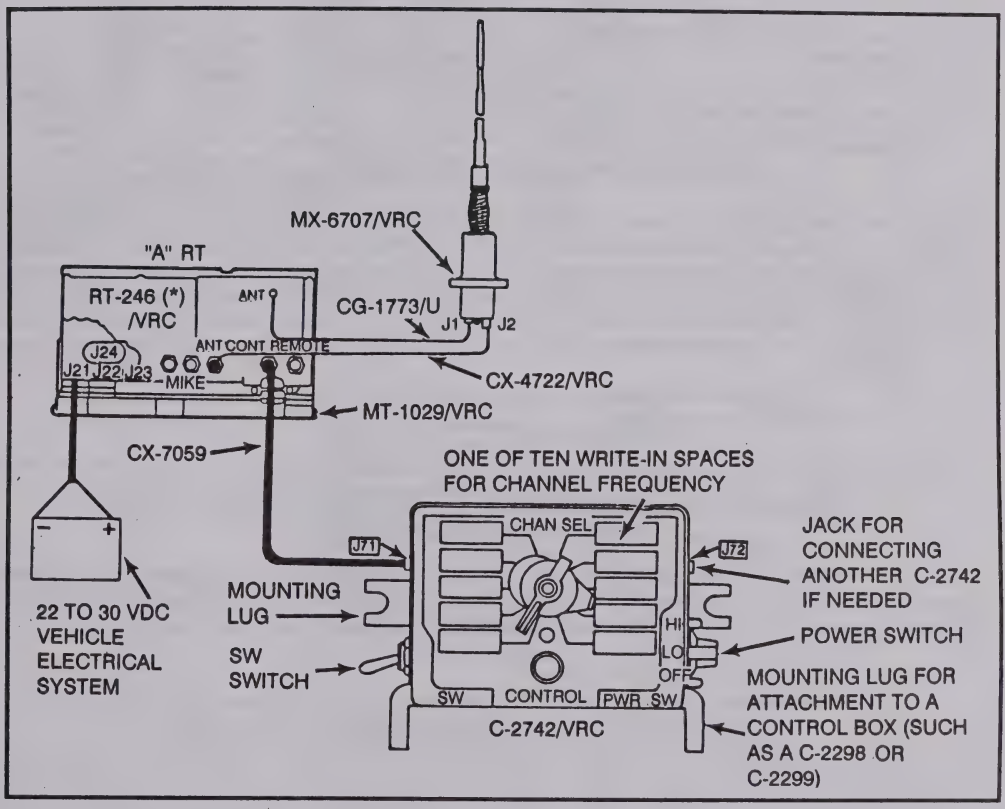


Figure 13. RT-246/VRC with remote operation and tuning control box C-2742 connected.

b. (See Figure 14.) In some AN/VRC-12 series radio configurations, two C-2742s can be connected in tandem. In this case, the C-2742 connected directly to the RT-246 is called the primary C-2742 Ⓐ. The C-2742 connected to the primary C-2742 is called the tandem C-2742 Ⓑ. Only one C-2742 at a time can be used to remotely select the RT-246 radion frequency (RF) transmit level and preset channel frequencies.

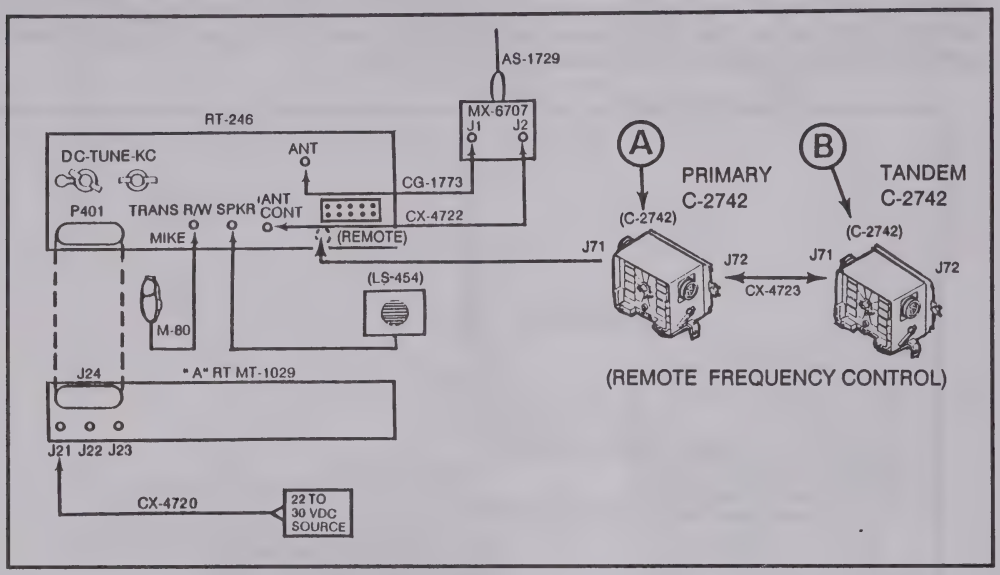


Figure 14. RT-246/VRC with C-2742 remote frequency control boxes connected in tandem.

c. (Refer to Figure 14.) The primary C-2742 jack J71 provides a connection to the RT-246. When it is in tandem, the tandem C-2742 is connected to the J72 of a primary C-2742. The tandem C-2742 jack J72 has no connection.

d. (See Figure 15.) The C-2742 power switch is used to turn the RT-246 on and off. It also selects the RT-246 RF transmit power level (HI or LO). Only a primary C-2742 power switch can be used to turn the RT-246 on and off.

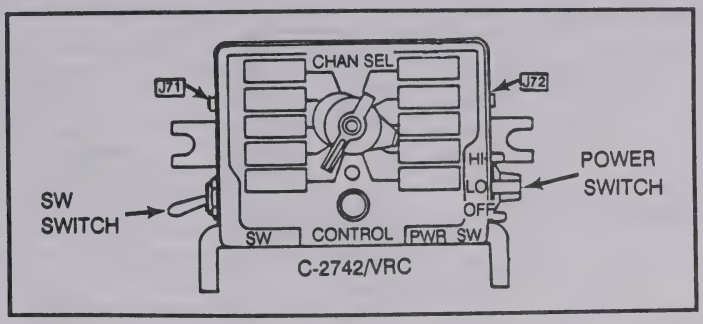


Figure 15. Primary C-2742 power switch location.

e. (See Figure 16.) The C-2742 SW switch is used to establish control at a specific C-2742/VRC. This switch is spring loaded and must be pushed to the rear and released. When the primary C-2742 power switch is at HI or LO (RT-246/VRC is on) pushing and releasing the SW switch establishes the selection of the RT-246 transmit RF power level. It also establishes the selection of the preset channel frequency at the C-2742 whose SW switch is activated.

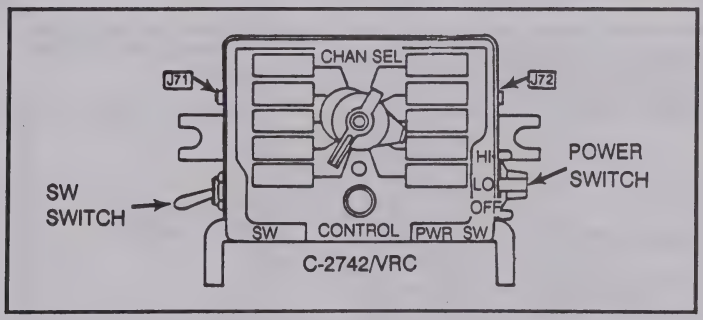


Figure 16. C-2742 SW (toggle) switch location.

f. (See Figure 17.) The C-2742 CONTROL lamp is located on the front panel. It lights to indicate the controlling C-2742/VRC. When in tandem, only one CONTROL lamp should be lit at one time.

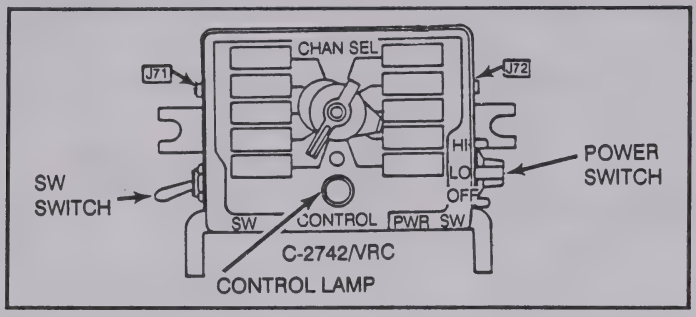


Figure 17. C-2742 CONTROL lamp location.

g. (See Figure 18.) The C-2742 channel selector, CHAN SEL, is a 10-position switch with write-in spaces for each position. Progressing clockwise, the lower left write-in position corresponds with Push Button 1, the next write-in position corresponds with Push Button 2, the next with Push Button 3, and so forth, to the lower right write-in position, which corresponds with Push Button 10. Push-button numbers correspond to the 10 push buttons located on the front of the RT-246.

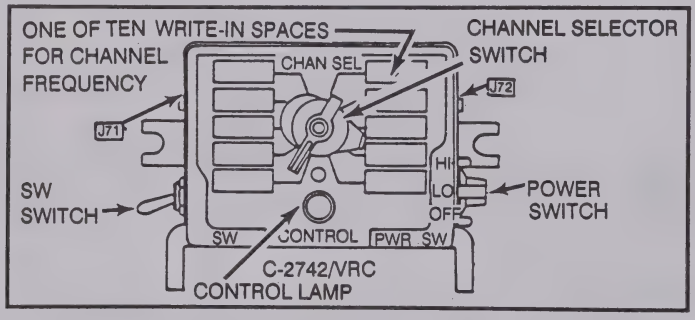


Figure 18. C-2742 channel selector switch and frequency write-in spaces location.

9. POWER INPUT TO RADIO SYSTEM COMSEC EQUIPMENT.

a. RT unit. The controlled voltage, + 22 to 30 VDC is obtained from Pin C of jack J22 of the MT-1029 mount and is applied to Pin C of plug P1 of the J-3513 junction box. From Pin C of P1, voltage is distributed through the J-3513 to Pin B of jack J2 and Pin H of jack J3. From Pin B of jack J2, voltage is applied to Pin B of the CX-13063 cable, through the cable to Pin A of the cable plug P2. Then, voltage is applied to Pin A of the HYP-57 jack J1, then to Pin 5 of jack J4 on the TSEC/KY-57. Voltage is then distributed to the TSEC/KY-57s internal circuits. Voltage from Pin H of jack J3 on the J-3513 is applied to Pin H of

plug P1 on the CX-13061/U cable through the cable to Pin N of plug P2 and then applied to Pin N of the radio jack J3 on the TSEC/KY-57. (See Figure 19.)

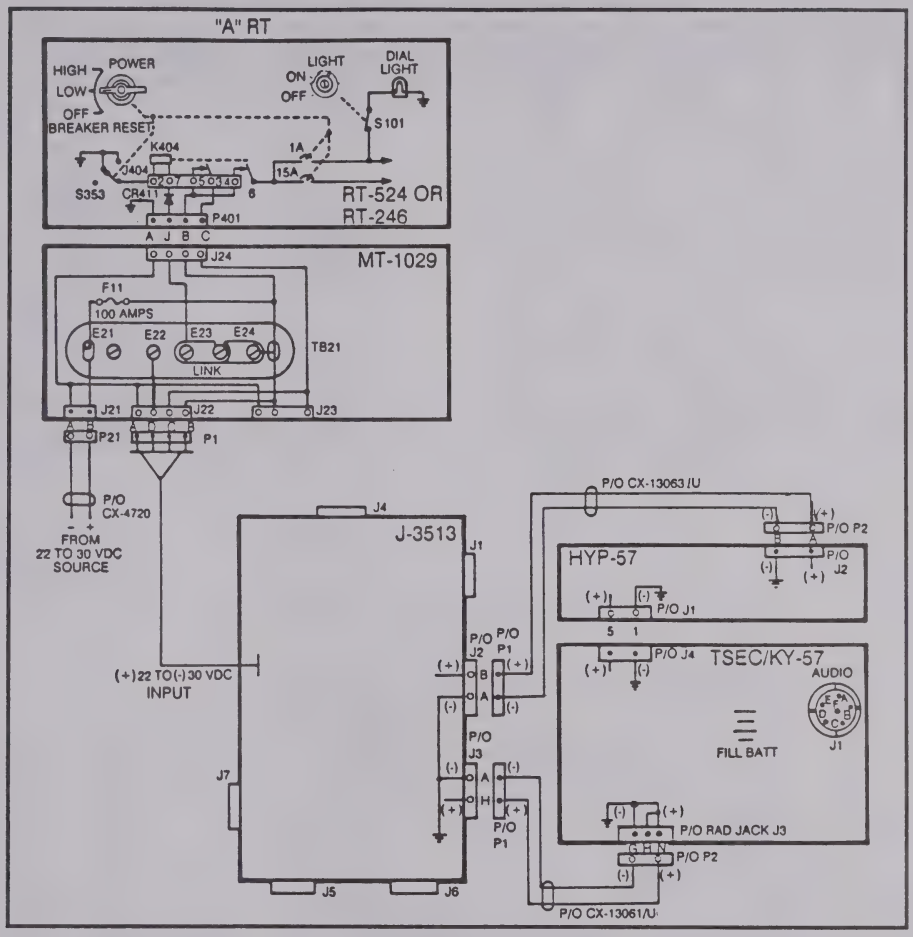


Figure 19. Controlled voltage circuits to RT units COMSEC equipment.

b. R-442 receiver. The controlled voltage, +22 to 30 VDC is obtained from Pin C of jack J12 of the MT-1898 mount and is applied to Pin C of plug P1 of the J-3514 junction box. From Pin C of P1, voltage is distributed through the J-3514 to Pin B of jack J4 and Pin H of jack J3. From Pin B of jack J4, voltage is applied to Pin B on plug P1 of the CX-13063/U cable, through the cable to Pin A of plug P2. Then, voltage is applied to Pin A on jack J2 of the HYP-57, to Pin 5 of the HYP-57s jack J1, then to Pin 5 of jack J4 on the TSEC/KY-57. Voltage is then distributed to the TSEC/KY-57 internal circuits. At the same time, voltage

from Pin H on jack J3 on the J-3514 is applied to Pin H on plug P1 of the CX-13061/U cable through the cable to Pin N of plug P2 and then applied to Pin N of the radio jack J3 on the TSEC/KY-57. (See Figure 20.)

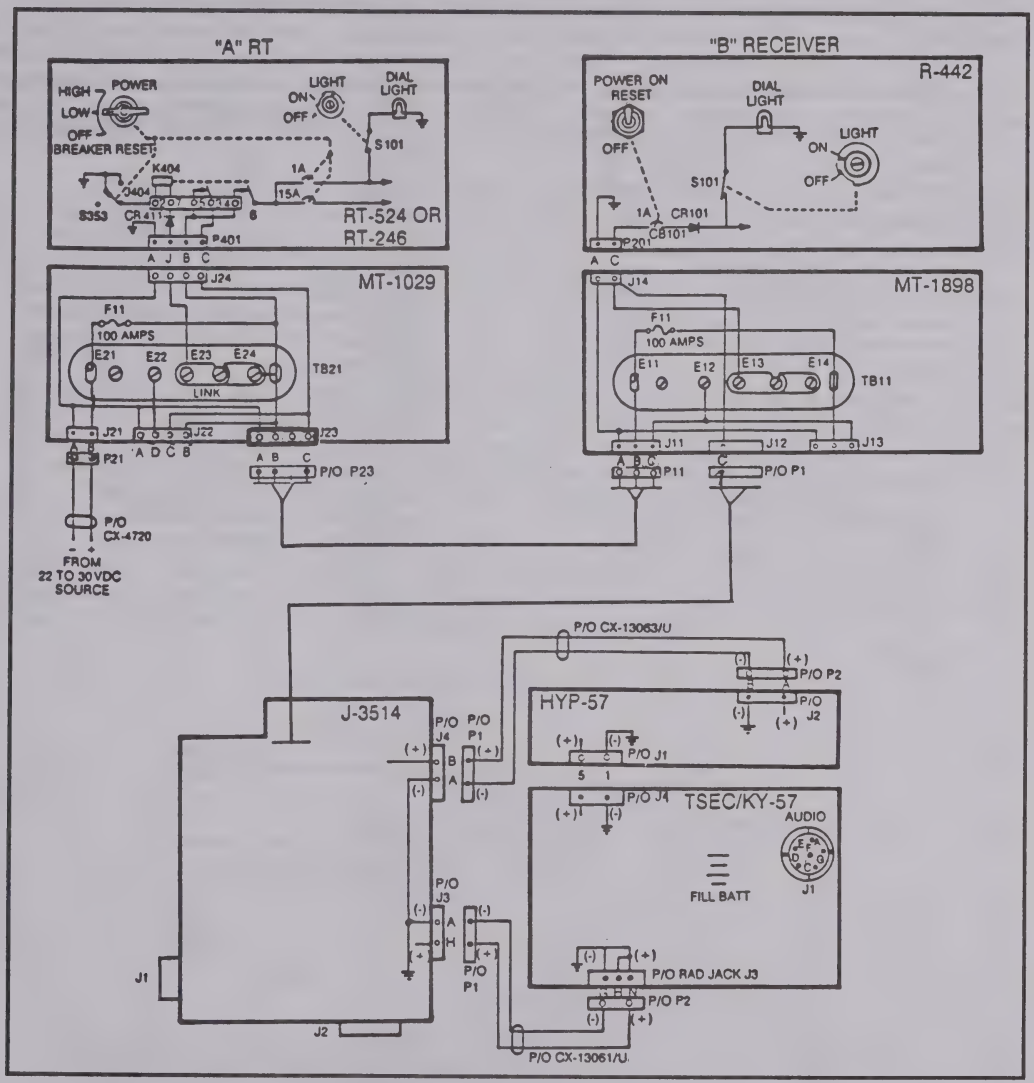


Figure 20. Controlled voltage circuits to R-442 COMSEC equipment (link in direct).

c. (See Figure 21). If you compare Figure 20 to Figure 21, you will note that the only difference in the circuits is the position of the link in the MT-1898 mount. The link position in Figure 21, remote, provides the RT unit with control of the input voltage to the R-442. You will note that the power for the R-442 COMSEC equipment is identical, regardless of the MT-1898 mount link position.

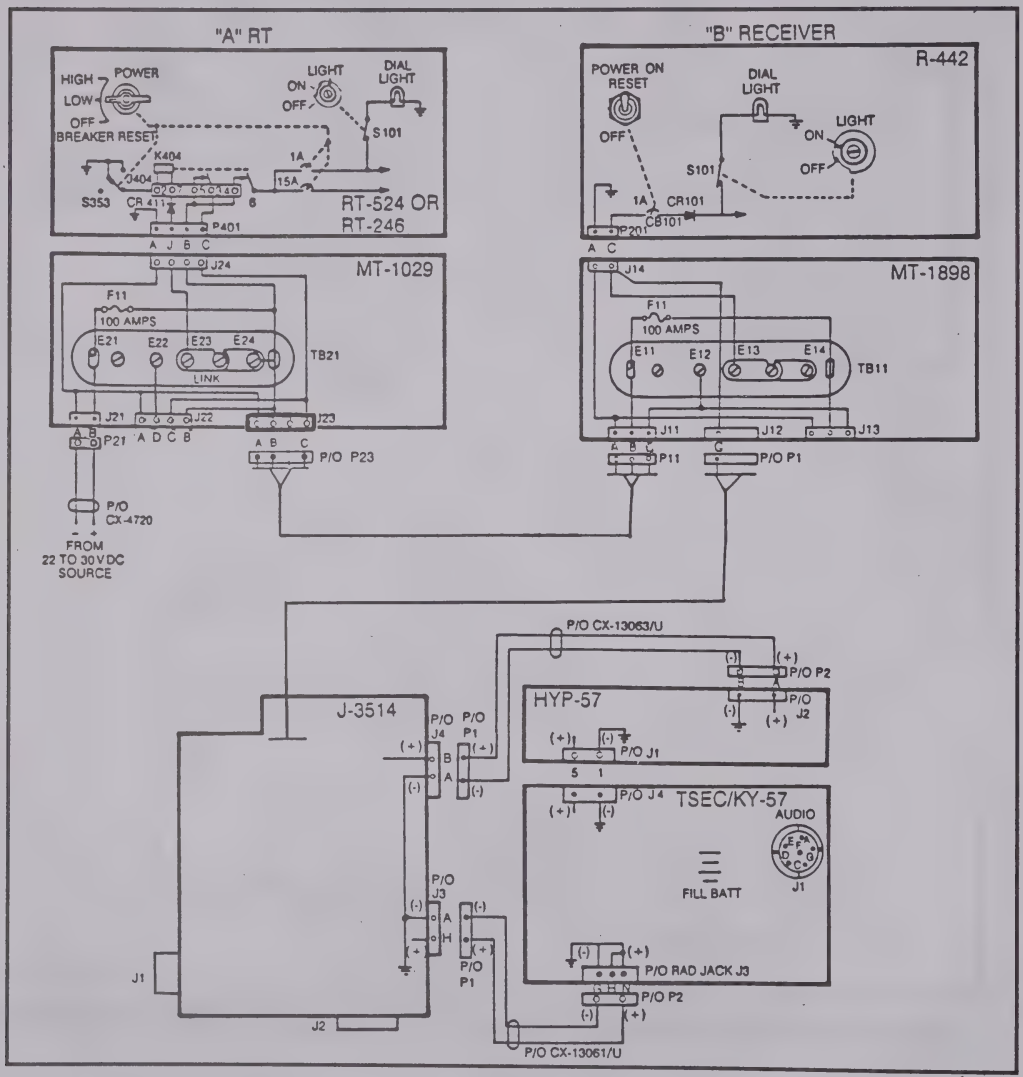


Figure 21. Controlled voltage circuit to R-442 COMSEC equipment (link in remote).

10. OPERATIONAL CHECK. The operational check (Appendix) provides a step-by-step procedure for evaluating wheeled vehicular mounted radio systems AN/VRC-48, AN/VRC-47, AN/VRC-46, AN/VRC-44, AN/VRC-43, and AN/VRC-12 (secure and without intercom). It specifies the procedure to be used to check the operational state of the radio set items of equipment. It includes tests for the RT unit, the RT antenna system, the auxiliary receiver, the receiver antenna, the radio component mounts, and the COMSEC equipment. The operational check (op check) normally is done with the equipment installed in the vehicle. When abnormal indications are observed for a specific op check step, that step may identify the bad item(s) of equipment. (Read step 1 of the Appendix, and then return to the text.)

a. If, when checking op check step 1, the normal indication occurs--the RT DIAL lamp lights--step 1 is working as it should. However, let us say that the RT DIAL lamp does not light. This is an indication of a possible input power problem, and it also is an indication of a burned-out dial lamp. To identify which one of the two indications exists, you must go to step 2 first; then go to step 3 to prove the indicated bad component.

b. In step 2, you are checking the audio output to the RT unit. (Read step 2 of the Appendix, and then return to the text.) If the normal indication occurs when checking step 2, you have a burned-out DIAL lamp and you must replace the burned-out DIAL lamp. However, if you did not observe the normal indication for step 2; that is, a rushing noise was not heard in the earphone and speaker, you will proceed to step 3. (Read step 3 of the Appendix, and then return to the text.)

c. When step 3 does not give the normal indication (switching sound heard at matching unit), you have abnormal indications for steps 1, 2, and 3. This indicates the radio being checked has a DC input power problem. The DC power input problem must be corrected before any other steps can be checked.

d. What have you found out about the DC input power of the radio?

(1) You have determined that if radio op check steps (1, 2, and 3) are bad, the RT DC input power circuit is bad; and the radio set will not operate.

(2) You know that the item of equipment causing this problem must be identified and corrected before you can continue with the operational check.

(3) You must record these bad indications on a DA From 2404 (Equipment Inspection and Maintenance Worksheet). Then you must troubleshoot, selecting the appropriate diagram, tracing circuits, and use proper troubleshooting techniques to identify and correct the bad item of equipment. (To see what your DA Form 2404 would look like with steps 1, 2, and 3 recorded on it, see Figure 22.)

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38-750; the proponent agency is the Office of the Deputy Chief of Staff for Logistics

1. ORGANIZATION				2. NOMENCLATURE AND MODEL			
C/2ND BN/3RD INF DIV				RADIO SET AN/VRC-47			
3. REGISTRATION/SERIAL/NSN	4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION	
31-36					3 FEB 85	DAILY	

7. APPLICABLE REFERENCE

TM NUMBER	TM DATE	TM NUMBER	TM DATE
11-5820-401-20-1	3 JAN 84		

COLUMN a — Enter TM item number.

COLUMN b — Enter the applicable condition status symbol.

COLUMN c — Enter deficiencies and shortcomings.

COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X"—Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X"—Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed until corrective action can be accomplished.

HORIZONTAL DASH "(-)"—Indicates that a inspection, component replacement, maintenance operation check, or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)"—Indicates a materiel defect other deficiency which must be corrected to increase efficiency or to make the item completely operable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL-Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT-Status symbols will be recorded in red.

SAMPLE

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED
SP4 C.E. Scott				

TM ITEM NO a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
1		NO DIAL LIGHT		
2		NO AUDIO OUTPUT		
3		NO SWITCHING SOUND IN MATCHING UNIT		

DA FORM 1 APR 79 2404 — Replaces edition of 1 Jan 64, which will be used

Figure 22. DA Form 2404 with the recorded op check steps that indicate a bad DC input power circuit.

e. To troubleshoot a bad DC input power circuit in an AN/VRC-12 series radio, you first make voltage checks to find the bad item of equipment. Resistance checks are then made to verify the actual defect--an open or a short.

f. For the RT to operate, it must receive 22 to 30 VDC from Pins B and J of jack J24. To get to these test points to make voltage measurements, the RT must be removed from its mount. (See Figure 23.)

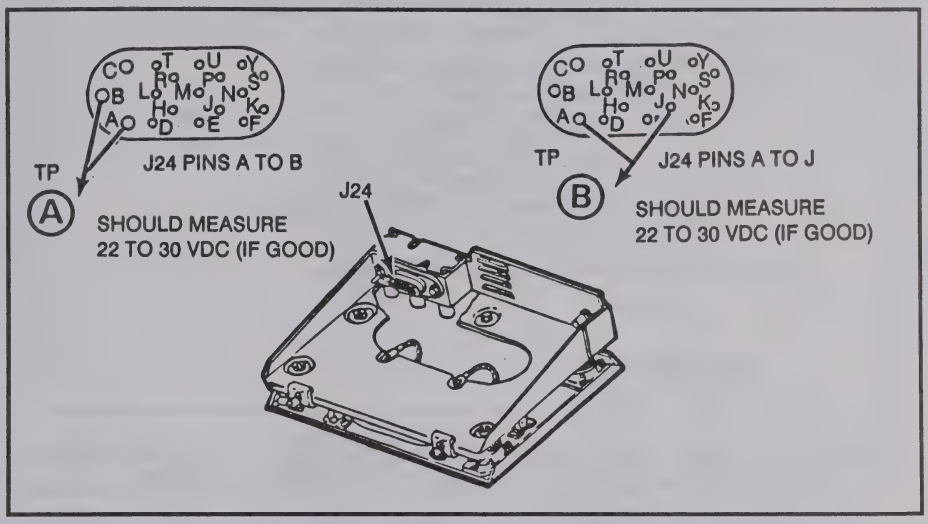


Figure 23. RT removed from MT-1029 exposing mounts voltage test points: Pins A to B and A to J on J24 (Pin A--negative, Pins B and J--positive.

g. If the voltage measurements between Pins A and B and Pins A and J on J24 are both 22 to 30 VDC, this indicates that voltage is getting from the vehicle batteries through the power cable CX-4720 through the mount to J24 Pins B and J. This indicates these items are good; therefore, the RT is the bad item of equipment.

(1) When the RT DC power circuits are bad, you send the RT to intermediate direct support (IDS) for repair. When making voltage checks between Pins A and B and A and J of J24, you find 22 to 30 VDC on Pins A and B, but no voltage at A and J. The MT-1029 is the bad item of equipment, and the problem will be an open between E24 and Pin J on J24. (See Figure 24.)

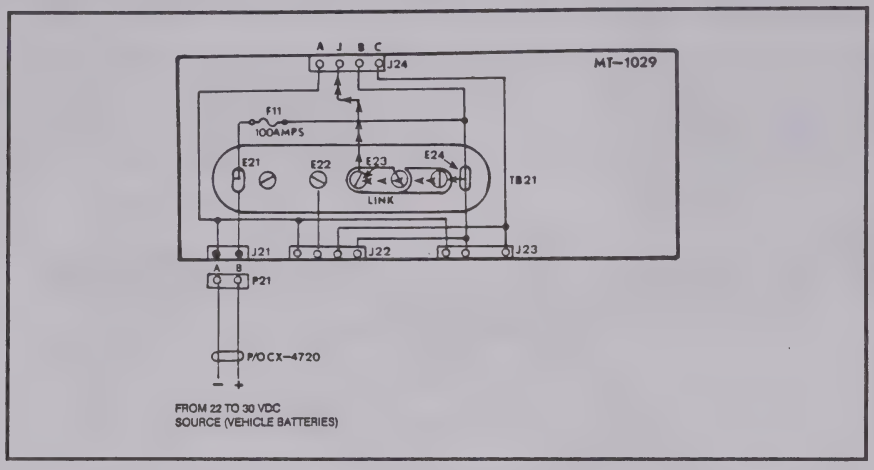


Figure 24. Simplified schematic of MT-1029 with cover removed from junction box. Voltage to Pin J is indicated by arrows.

(2) If the mount is defective, causing no voltage to be present at Pin J of J24, the circuit is open. This defect will be found by making continuity checks on this circuit, half of the circuit at a time to determine which half is bad by going to selected test points. (See Figure 25.)

WARNING

BEFORE MAKING OHMS/CONTINUITY CHECKS, MAKE SURE ALL VOLTAGE IS DISCONNECTED FROM THE CIRCUITS UNDER TEST.

NOTE: A continuity check is made from one end of a circuit (wire) to the other end of the same circuit (wire) to determine if the circuit is complete; that is, unbroken.

- A broken circuit continuity check will show infinite (∞) ohms.
- An unbroken circuit continuity check will show 0 ohms.

h. Measure from E24 to E23, and from E23 to Pin J of J24. A good reading is 0 ohms; an infinite reading indicates an open circuit. An open between E24 and E23 could be caused by the link being incorrectly positioned. You must correctly position the link between E23 and E24 to remove the open. If an open is found between E23 and Pin J of J24, it is your responsibility to resolder the wire to the correct contact. (See Figure 25.) If a multiple wire problem occurs in the MT-1029, the MT-1029 will be sent to IDS with a DA Form 2407 (Maintenance Request) requesting repairs.

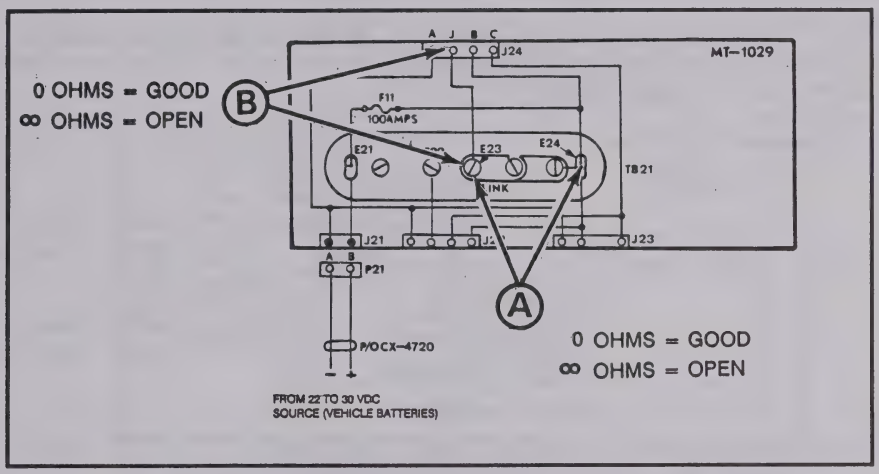


Figure 25. Simplified schematic of MT-1029, cover removed. J circuit ohms checks identified by (A) and (B).

i. If, when checking MT-1029 for correct voltages, a measurement of 0 volts is observed between Pins A and B of J24, the next check to be made is a voltage check of the vehicle batteries. The voltage that should be on Pin B of J24 comes from the positive terminal of one of the vehicle batteries, through the CX-4720 cable to Pin B of P21, and from Pin B of J21 through the mount to Pin B of J24. (See Figure 26.)

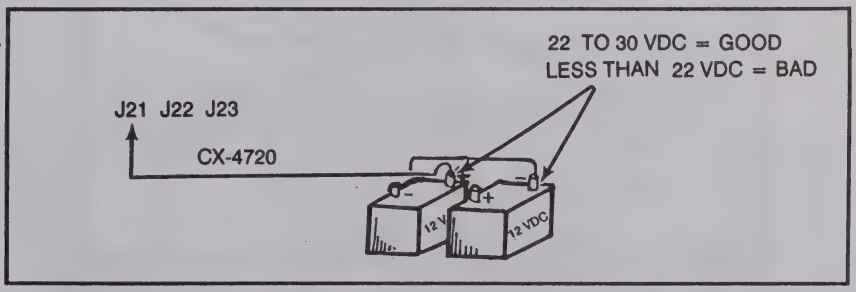


Figure 26. Two 12 VDC vehicle batteries wired in series with power cable CX-4720 attached.

j. To check the vehicle batteries, two 12-volt DC batteries connected in series, you must set up your multimeter to read DC volts on the 200-volt range. Measure between the negative terminal of one battery to the positive terminal of the other battery. A normal voltage should be between 22 VDC and 30 VDC. Another method to determine if the vehicle batteries are good or bad is to turn the radio off and try to start the vehicle. If the vehicle starts, the batteries are not the problem. Next, check the CX-4720 connections to the batteries to see if the connections require cleaning. If the batteries are bad, report this to the unit motor sergeant and have them replaced. (See Figure 27.)

(1) If the vehicle batteries and the CX-4720 power cable battery connections are good, you must now determine if the 22 to 30 VDC is reaching the input of the MT-1029. (See Figure 27.)

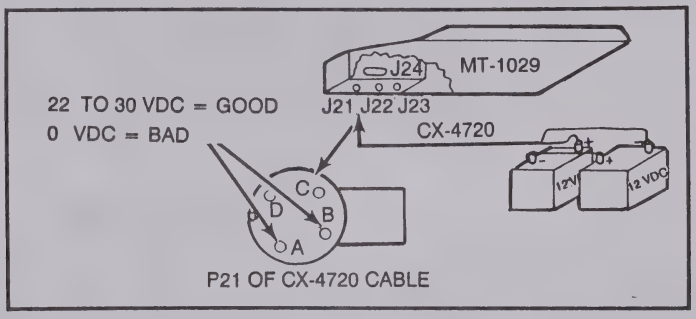


Figure 27. MT-1029 mount disassembled for access to Pins A and B of P21 of CX-4720 cable.

The input voltage to the MT-1029 is applied to J21 on the bottom of the mount, from P21 on the end of the CX-4720 power cable. To measure voltage at P21, first remove the four hold-down screws in the mount deck (RT tray), next remove plug P21 from J21, and then make a DC voltage measurement between Pins A and B of P21. (See Figure 28.)

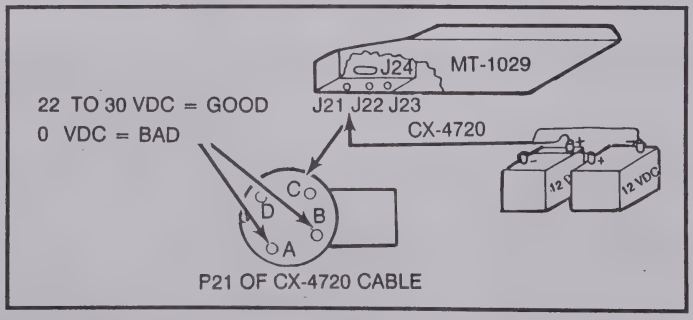


Figure 28. MT-1029 disassembled for access to Pins A and B of P21 of CX-4720 power cable.

(2) If the voltage check between Pins A and B of P21 is 22 to 30 VDC and the voltage check made between Pins A and B of J24 is 0 volts, these two checks identify the mount MT-1029 as the bad item of equipment. To verify this, you will make continuity checks through the mount to find the actual open part of the mount power circuit. Remember, when making continuity checks, a meter reading of 0 ohms indicates a complete circuit; and a meter reading of infinite ohms indicates an open circuit. (See Figure 29.)

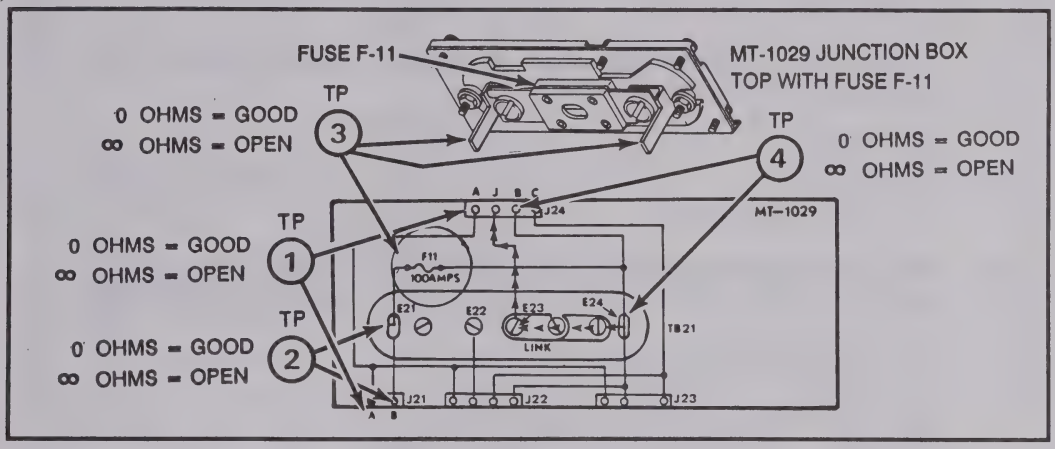


Figure 29. MT-1029 mount with junction box top removed--test point (TP) exposed (continuity checks).

(3) If the voltage check between Pins A and B of the CX-4720 power cable is 0 volts and the vehicle batteries check good, the CX-4720 cable is bad. To find the actual defect in the cable, you will make continuity checks to verify the problem, and then repair or replace it as required. (See Figure 30.)

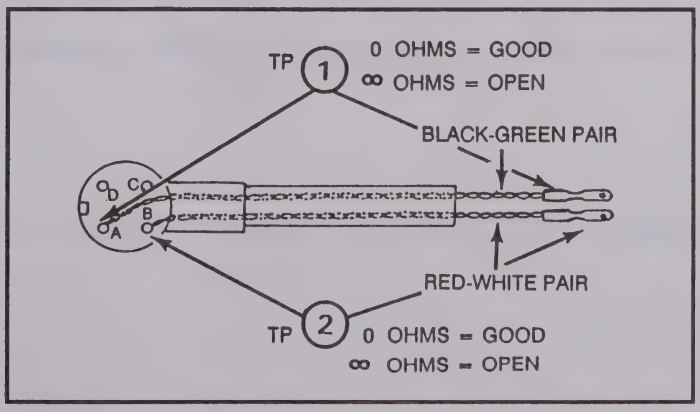


Figure 30. CX-4720/VRC power cable test points for continuity checks.

PRACTICE EXERCISES:

6. Which cable applies source voltage from the MT-1029 to the MT-1898 mount?

   a. CG-1773
   b. CX-4720
   c. CX-4721
   d. CX-4722

7. If the link in the MT-1898 mount is connected between E13 and E14, which mode of operation is used?

   a. REMOTE
   b. DIRECT
   c. RELAY
   d. none of the above

8. When the B receiver mount MT-1898 is set up for remote power operation, what component controls the power input to the MT-1898?

   a. CG-1127/U
   b. CG-1773/U
   c. R-442
   d. RT-524 (246)

9. Which steps of the op check (Appendix) will give abnormal indications if the RT has a DC input power problem?

   a. 1, 2, and 4
   b. 1, 3, and 5
   c. 2, 3, and 4
   d. 1, 2, and 3

//

ANSWERS:

6. c.
7. b.
8. d.
9. d.

//

k. When the receiver-transmitter being checked is an RT-246 and the radio has a control box C-2742, check to make sure the C-2742 is correctly cabled. (See Figure 31.)

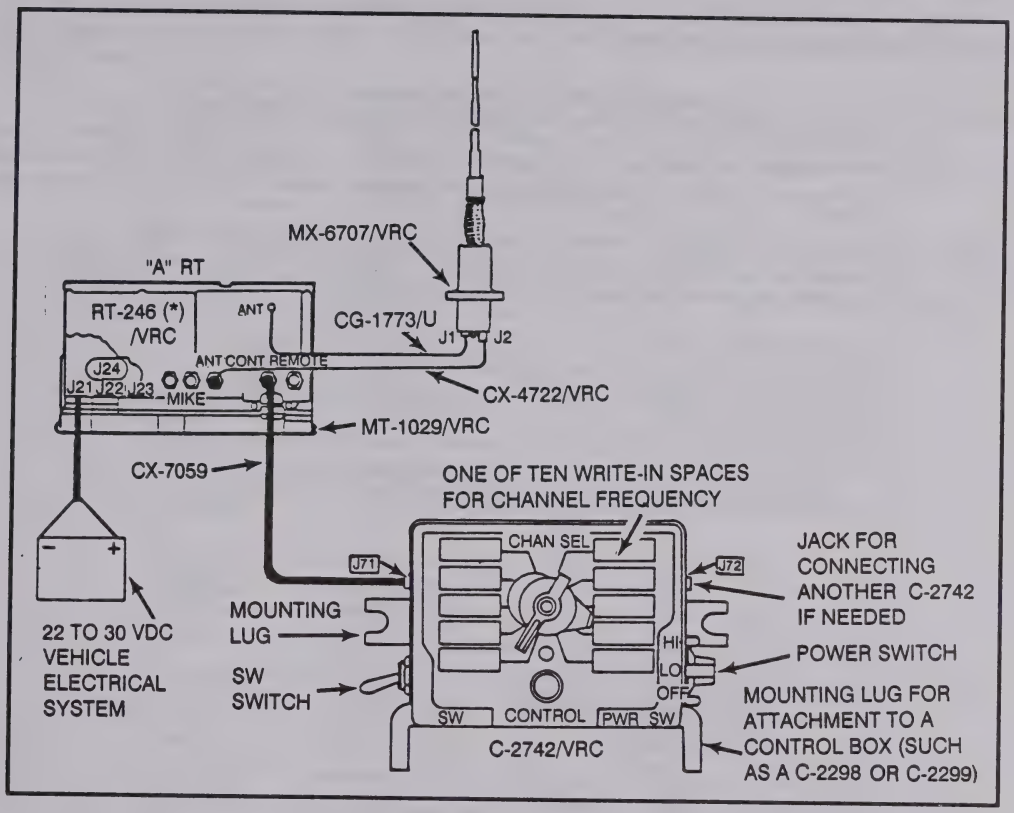


Figure 31. Cabling diagram for RT-246 using a control box C-2742/VRC (remote box).

(1) (Read step 10 of the Appendix, and then return to the text.) Step 10 checks RT-246 remote input power control. When checking step 10, the setup instructions must be followed.

(2) (See Figure 32.) If step 10 is bad, the abnormal indications listed on this DA Form 2404 may be observed.

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38-750; the proponent agency is the Office of the Deputy Chief of Staff for Logistics.

1. ORGANIZATION				2. NOMENCLATURE AND MODEL			
3. REGISTRATION/SERIAL/NSN	4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION	
7. APPLICABLE REFERENCE							
TM NUMBER	TM DATE	TM NUMBER	TM DATE				

COLUMN a — Enter TM item number.
COLUMN b — Enter the applicable condition status symbol.
COLUMN c — Enter deficiencies and shortcomings.
COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.
COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X"—Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X"—Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed until corrective action can be accomplished.

HORIZONTAL DASH "(–)"—Indicates that a inspection, component replacement, maintenance operation check, or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)"—Indicates a materiel defect other deficiency which must be corrected to increase efficiency or to make the item completely serviceable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL-Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT-Status symbols will be recorded in red.

SAMPLE

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED

TM ITEM NO. a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
10.a		RT DIAL LAMP		
		LIGHTS WITH		
		RT POWER SWITCH		
		IN REMOTE		
		(OR)		
10b		RT DIAL LAMP		
		AND C-2742		
		CONTROL LAMP		
		FAILED TO LIGHT		

DA FORM 1 APR 79 2404 Replaces edition of 1 Jan 64, which will be used

Figure 32. EPC step 10--possible bad indications.

(3) (Refer to Figure 31.) This figure identifies the three possible bad items of equipment. They are:

- RT-246/VRC.
- CX-7059 cable.
- C-2742 control box.

l. If in step 10a an abnormal indication of RT DIAL lamp lights with RT POWER switch in REMOTE, you can identify the bad item of equipment by the following:

(1) Remove the CX-7059 cable from jack J71 on the C-2742. If the RT DIAL lamp goes out, the C-2742 is shorted and will be sent with a DA Form 2407 to IDS for repairs.

(2) If the RT DIAL lamp remains lit, disconnect the CX-7059 cable from the RT remote jack J306. If the RT DIAL lamp goes out, the CX-7059 cable is defective (shorted); and it should be repaired or replaced. However, if the RT DIAL lamp remains lit, the RT-246 is bad and must be sent to IDS.

m. If there is an abnormal indication in step 10, the RT DIAL lamp and the C-2742 CONTROL lamp failed to light, the possible bad items of equipment are the C-2742, CX-7059, and the RT-246. To determine which item of equipment is actually bad, you must make DC voltage checks.

(1) Disconnect the CX-7059 cable from the C-2742 jack J71 (Figure 33 Ⓐ), and locate Pin A negative and Pin N positive.

(2) Set up the multimeter to measure DC voltage, Ⓑ, 200-volt range.

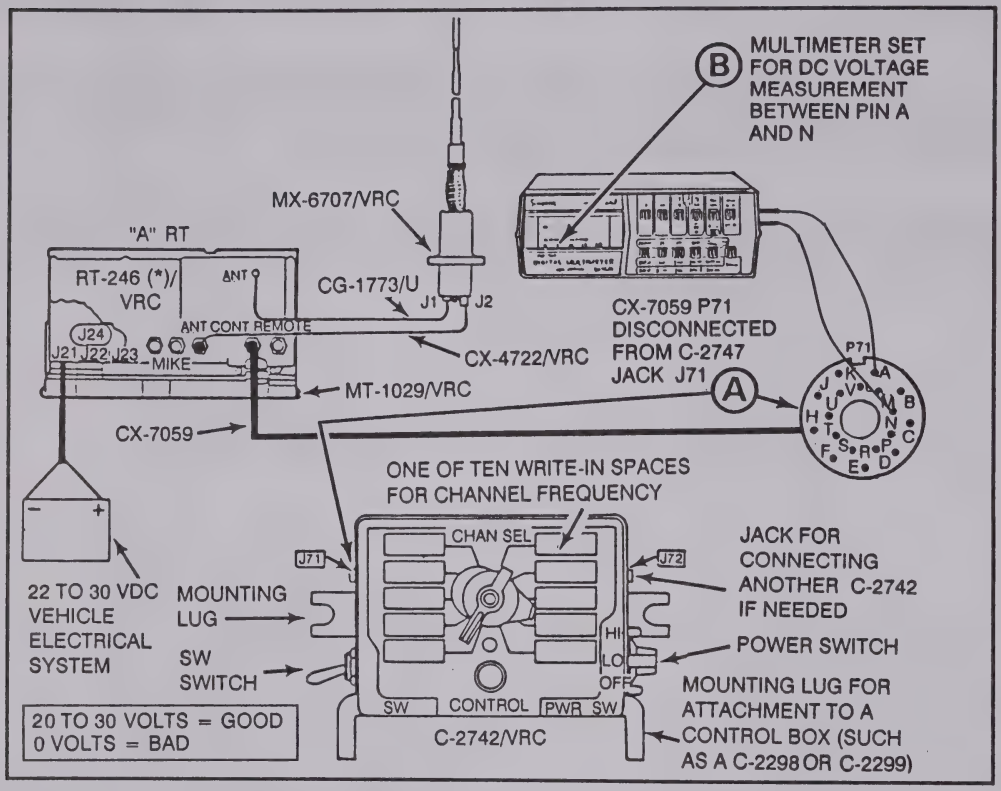


Figure 33. Voltage measurement at Pins A and N of CX-7059 cable plug P71.

(a) If a good reading (22 to 30 VDC) is indicated, the C-2742 is bad; and it will be sent with a DA Form 2407 to IDS for repairs. However, if a 0 voltage measurement is indicated, the C-2742 is good and either the CX-7059 cable or the RT-246 is bad. To determine which of these items is actually bad, voltage checks must be made on the RT remote jack J306. (See Figure 34.)

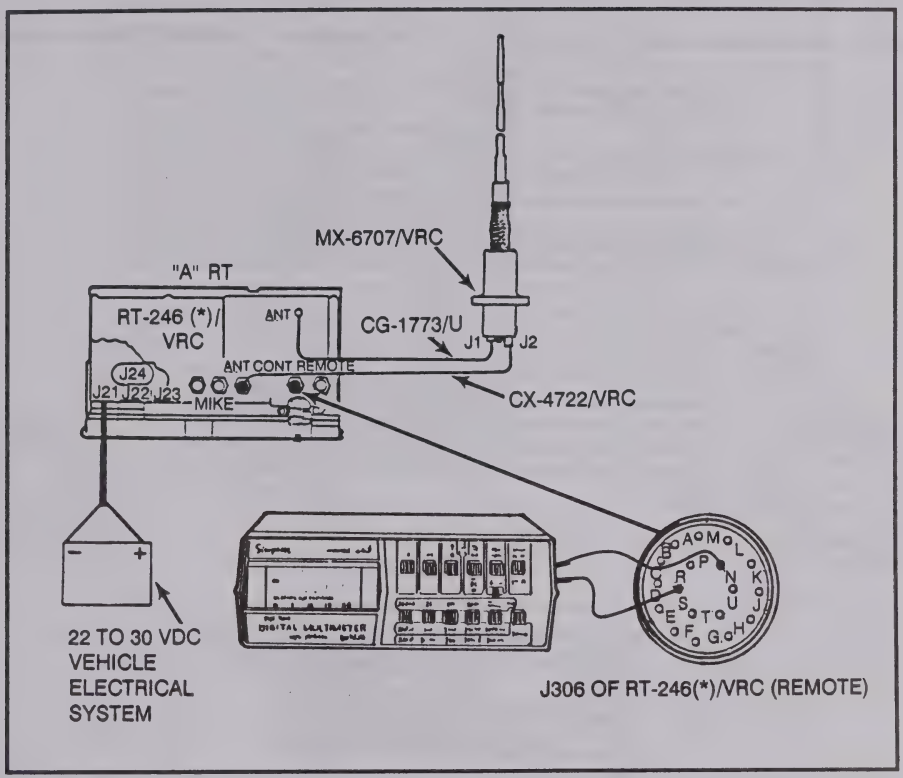


Figure 34. Voltage measurement at Pins N and R of RT-246 remote jack J306.

(b) If a good reading of 22 to 30 VDC is not obtained, the RT is bad; and it will be sent with a DA Form 2407 to IDS for repairs. However, if a voltage check at jack J306 is good, the CX-7059 cable is bad; and it should be checked to identify the actual open circuit; that is, Pin R of P306 to A of P71 open, or Pin N to N open. (See Figure 35.) An infinite reading on either circuit identifies the open circuit. Repair or replace the cable.

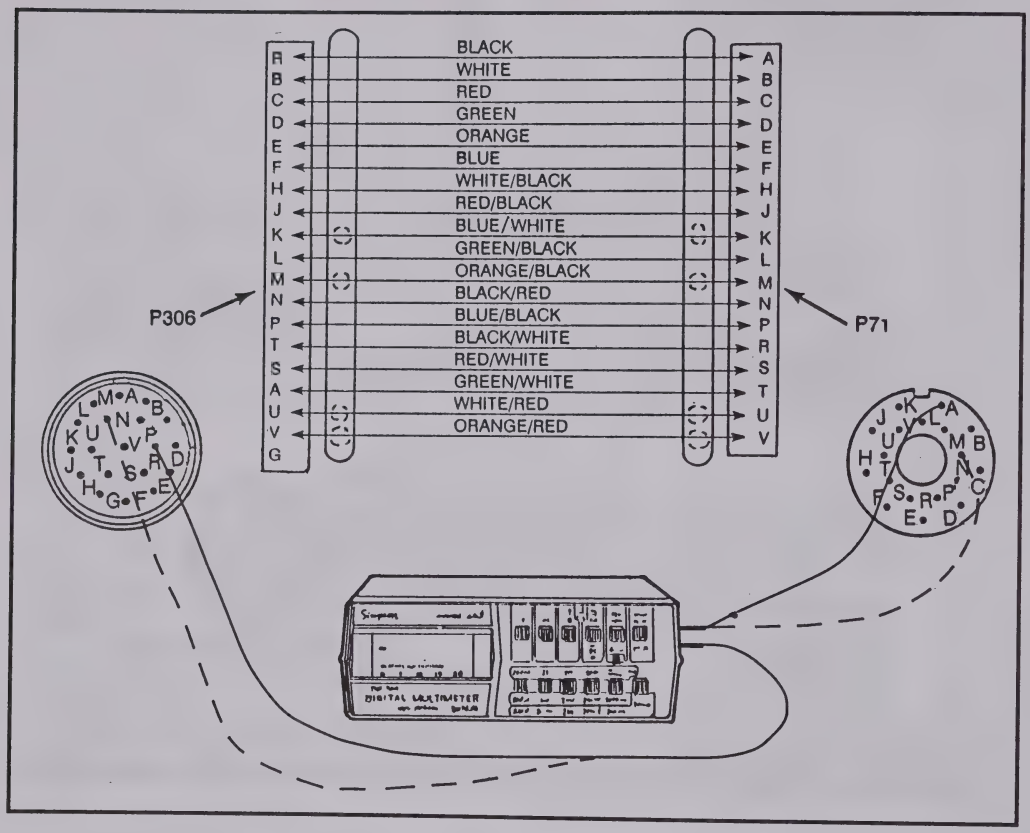
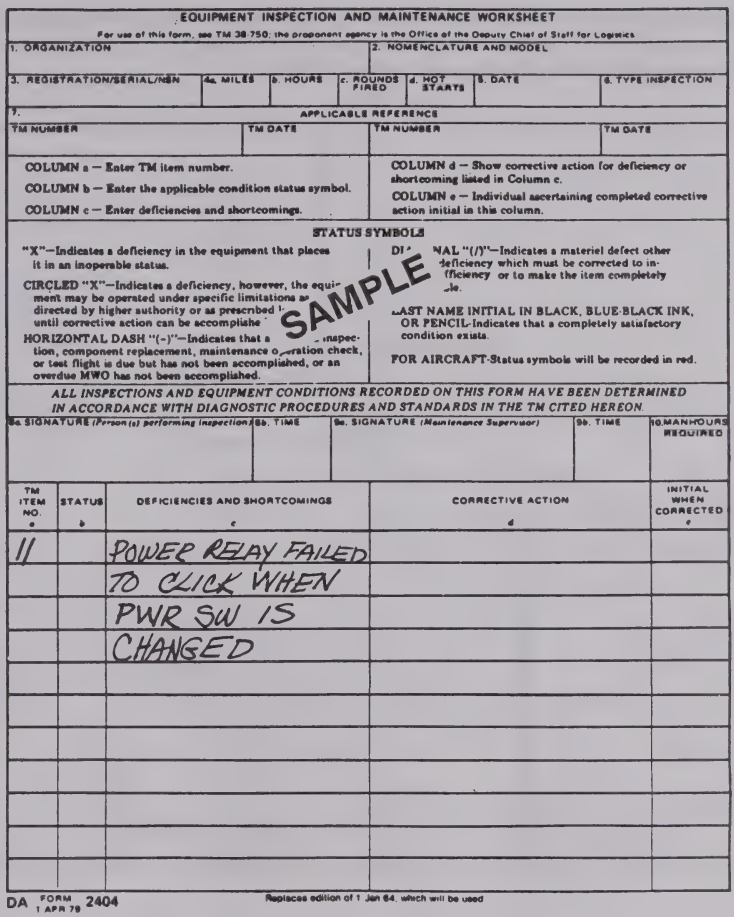


Figure 35. Continuity checks of CX-7059 cable, Pin R to A and Pin N to N.

n. Read step 11 in the Appendix, and then return to the text. Step 11 checks the RT-246 HI-LO transmit RF power control. (See Figure 36).

(1) If step 11 is bad, the abnormal indication shown on the DA Form 2404 will occur.



EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38-750; the proponent agency is the Office of the Deputy Chief of Staff for Logistics

1. ORGANIZATION | 2. NOMENCLATURE AND MODEL

3. REGISTRATION/SERIAL/NSN | 4a. MILES | b. HOURS | c. ROUNDS FIRED | d. HOT STARTS | 5. DATE | 6. TYPE INSPECTION

7. APPLICABLE REFERENCE

TM NUMBER | TM DATE | TM NUMBER | TM DATE

COLUMN a — Enter TM item number.

COLUMN b — Enter the applicable condition status symbol.

COLUMN c — Enter deficiencies and shortcomings.

COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X"—Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X"—Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed in [illegible] until corrective action can be accomplished.

HORIZONTAL DASH "(–)"—Indicates that a [illegible] inspection, component replacement, maintenance operation check, or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)"—Indicates a materiel defect other than deficiency which must be corrected to increase efficiency or to make the item completely operable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL-Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT-Status symbols will be recorded in red.

SAMPLE

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection) | 8b. TIME | 9a. SIGNATURE (Maintenance Supervisor) | 9b. TIME | 10. MANHOURS REQUIRED

TM ITEM NO. a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
11		POWER RELAY FAILED TO CLICK WHEN PWR SW IS CHANGED		

DA FORM 1 APR 79 2404 Replaces edition of 1 Jan 64, which will be used

Figure 36. Equipment performance checklist (EPC) step 11--possible bad indication.

(2) The items of equipment that could cause this abnormal indication to occur are the RT-246, the CX-7059, and the C-2742. To identify the actual bad item, Pin P must be grounded.

o. (See Figure 37.) Disconnect the CX-7059 cable plug P71 from the C-2742 jack J71, and locate Pin A ground and Pin P which connects to the high-low relay K406. Place a jumper between these two pins of P71.

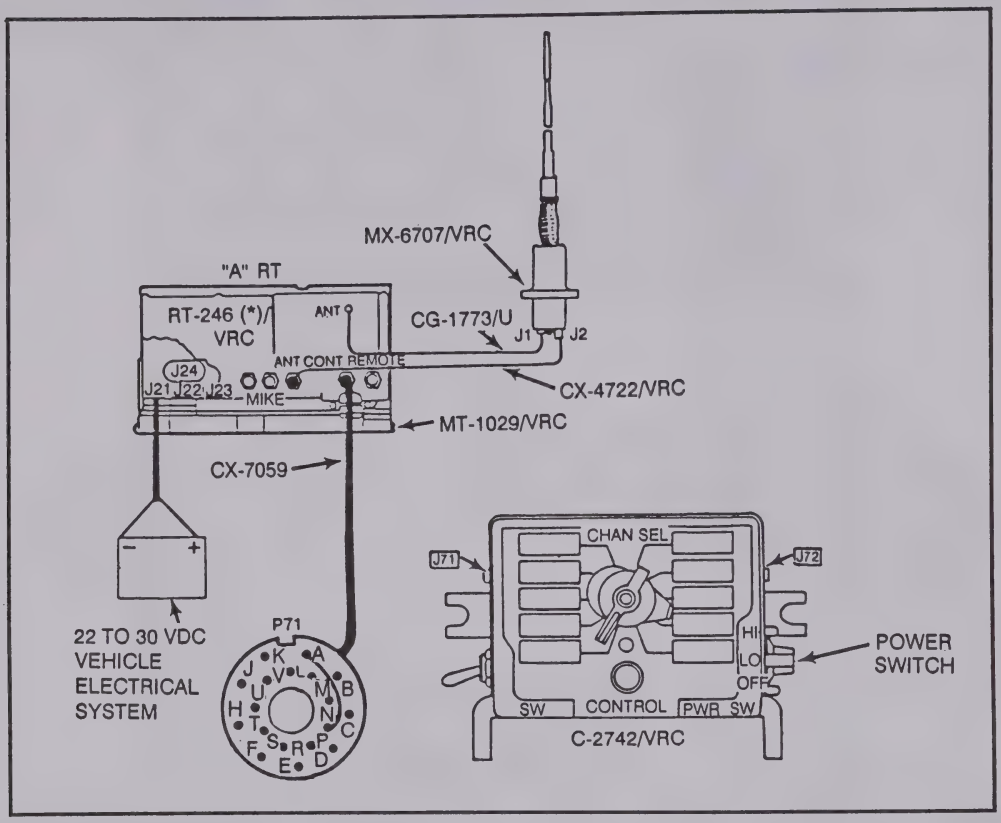


Figure 37. Jumper between Pins P and A of plug P71 on CX-7059 cable.

(1) If the high-low relay in the RT clicks, the C-2742 is bad and will be sent to IDS with a DA Form 2407 for repairs. However, if the relay does not click, either the CX-7059 cable or the RT-246 is bad. To find out which, perform the procedure in paragraph (2).

(2) Remove the CX-7059 cable from the RT-246 remote jack J306, identify Pins R and P on the remote jack, and place a jumper between these two pins. (See Figure 38.) If the relay does not click, the RT-246 is bad and it should be sent with a DA Form 2407 to IDS for repairs. However, if the relay clicks, this eliminates the RT as a possible bad item and at the same time identifies the CX-7059 cable as being bad.

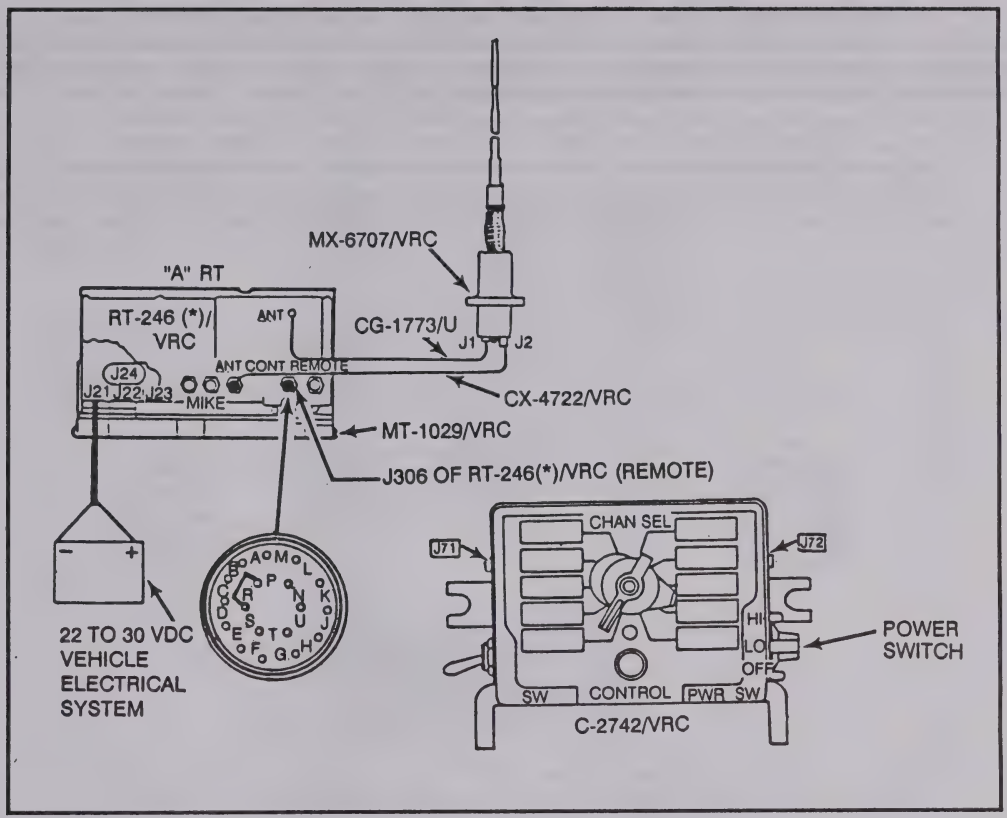


Figure 38. Jumper between Pins R and P at the RT-246 remote jack J306.

(3) If the CX-7059 is bad, the defect in the cable must be found. To do this, make a continuity check from Pin P of P71 to Pin P of P306 (see Figure 39). A reading of infinite ohms identifies the open circuit in this cable. If an open circuit is found, repair or replace the cable.

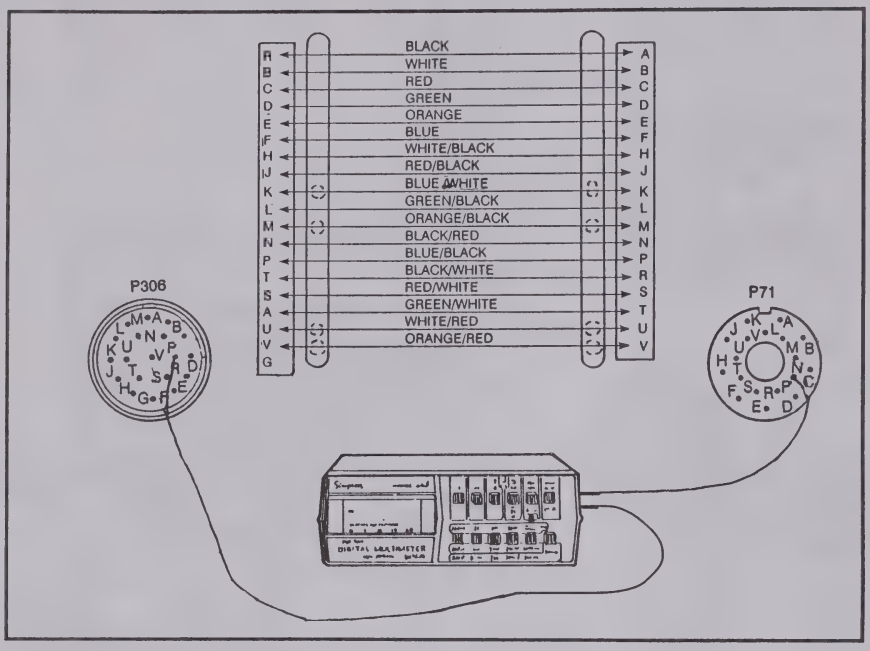


Figure 39. Continuity check of CX-7059 cable, Pin P to P of P71 to P306.

11. SUMMARY. In this learning event, you learned DC power input and distribution circuits and which op check steps are used to check power operation in an AN/VRC-12 series radio set with COMSEC equipment. You have learned where a power circuit can be opened to make voltage measurements to identify a bad component or cable. You learned how continuity checks using an ohmmeter may be used to verify the actual circuit defect. You learned what forms are used to record repairs or disposition of equipment that you cannot repair. If you apply the skills and knowledge gained in this learning event, you will be able to repair or send for repair any AN/VRC-12 series radio set with COMSEC equipment that has a DC power input problem.

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LEARNING EVENT II

System Troubleshoot AN/VRC-12 Series Radio Set With COMSEC Equipment Antenna Matching Unit DC Control Circuits to a Defective Component or Cable

12. TROUBLESHOOT AN/VRC-12 SERIES RADIO SET WITH COMSEC EQUIPMENT MATCHING UNIT DC CONTROL CIRCUIT. To troubleshoot an AN/VRC-12 series radio set matching unit DC control circuits, you must know the following: (See Figure 40)

- How the matching unit is connected to the RT unit.
- How control voltages are applied to the matching unit in accordance with the frequency setting of the RT unit.
- Which EPC steps check the operation of the matching unit DC control circuits.
- How to make voltage measurements at selected test points to identify the actual defective item.
- How to make continuity checks to identify the actual circuit defect.
- How to record this information on a DA Form 2404.

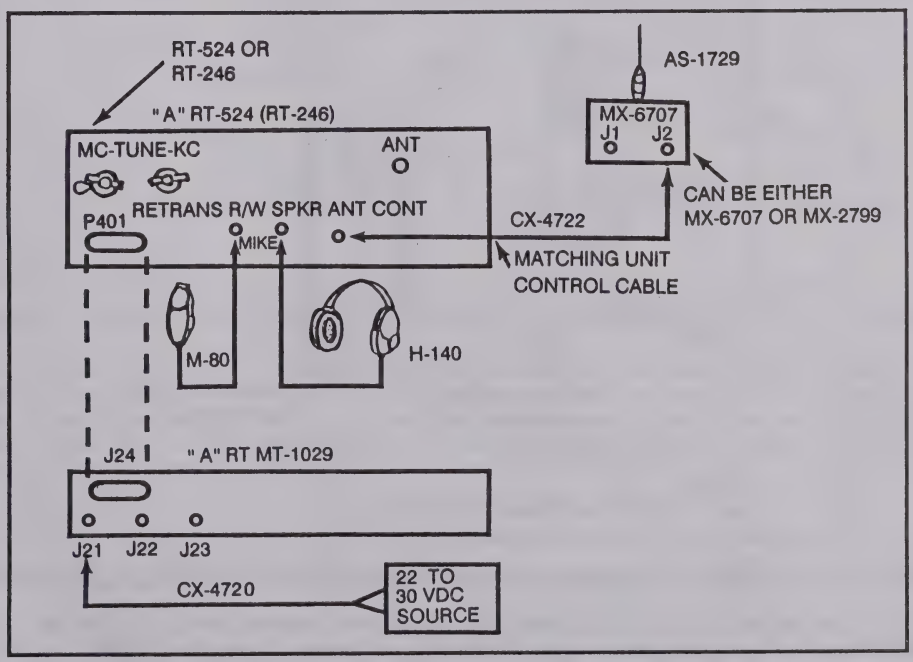


Figure 40. RT unit cabled to matching unit MX-6707 with matching unit voltage control cable CX-4722.

a. Figure 40 shows how the RT is connected to the matching unit. The matching unit can either be an MX-6707 or an MX-2799. Let us look at the two matching units and find out how they differ from each other. First, we will look at the MX-2799. (See Figure 41.)

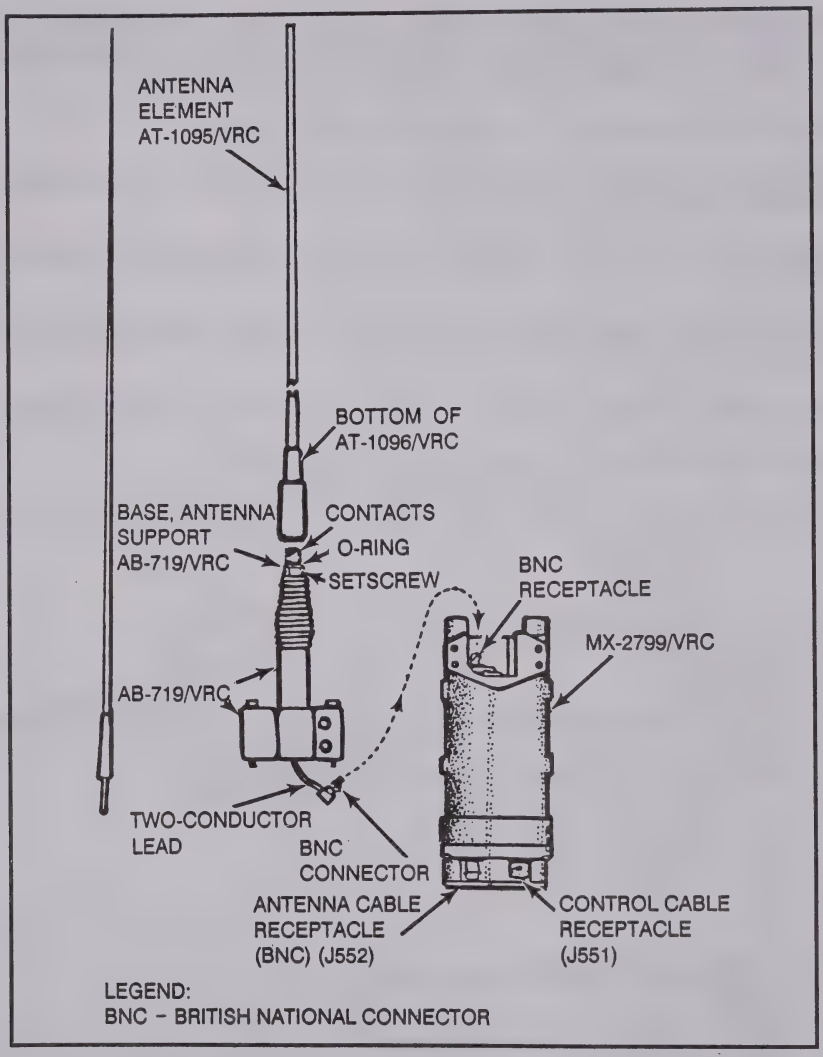


Figure 41. MX-2799 P/O antenna AT-912/VRC used with RT-524/VRC or RT-246/VRC.

b. The antenna AT-912 is used with receiver-transmitters RT-524 and RT-246. It consists of a base antenna support AB-719, antenna elements AT-1095 and AT-1096, and antenna matching unit MX-2799. The antenna is about 10 feet long, weighs about 20 pounds, and has a steel spring assembly AB-719 which allows the antenna to bend

without breaking when it strikes an obstruction. MX-2799 does not have a frequency band selector switch. Let us compare this antenna system with the antenna system that uses the matching unit MX-6707. (See Figure 42.)

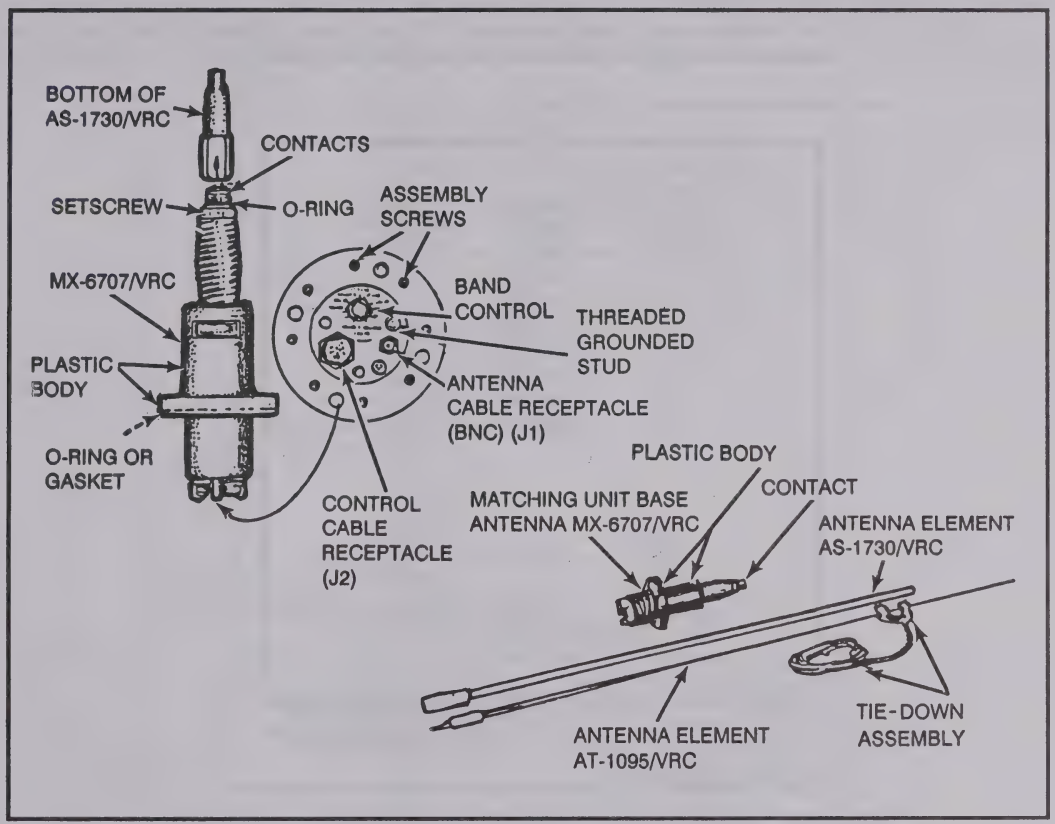


Figure 42. MX-6707, P/O antenna AS-1729/VRC used with RT-524/VRC or RT-246/VRC.

c. The antenna AS-1729 was designed to replace antenna AT-912. The AS-1729 is smaller and lighter than the AT-912 and permits either manual or automatic tuning of the antenna matching unit. It consists of an antenna matching unit MX-6707 and antenna elements AS-1730 and AT-1095 and has a spring assembly which allows the antenna to bend without breaking when it strikes an obstruction.

d. The purpose of the matching unit is to tune the antenna system to the operating frequency of the RT unit. When the antenna is properly tuned, the RF signal transferred between the RT unit and the antenna system will be of maximum strength. The antenna matching unit contains 10 tuning circuits to accomplish this tuning function. (See Figure 43.)

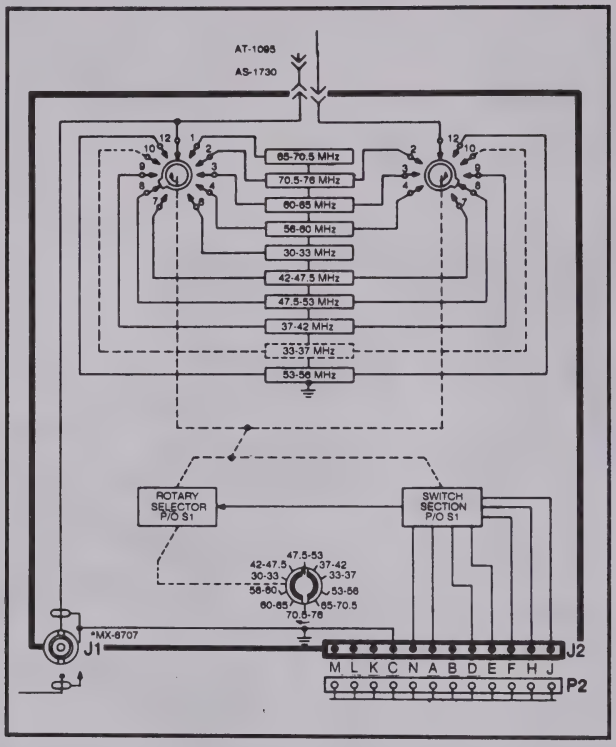


Figure 43. Matching unit MX-6707 with 10 tuning circuits.

e. After turning the RT unit on, the operator turns the RT MC-TUNE-KC tuning controls to select the operating frequency. Initially, the BAND switch applies control voltage to the antenna control inside the RT unit, Pins N and A for BAND Ⓐ, and Pins N and B for BAND Ⓑ. The antenna frequency control, in turn, applies voltages to certain pins at the antenna control jack (J353). The BAND switch position (BAND Ⓐ or Ⓑ) and the RT frequency that is selected by the MC-TUNE-KC tuning controls determine which pins have voltage applied to them. (See Figure 44.)

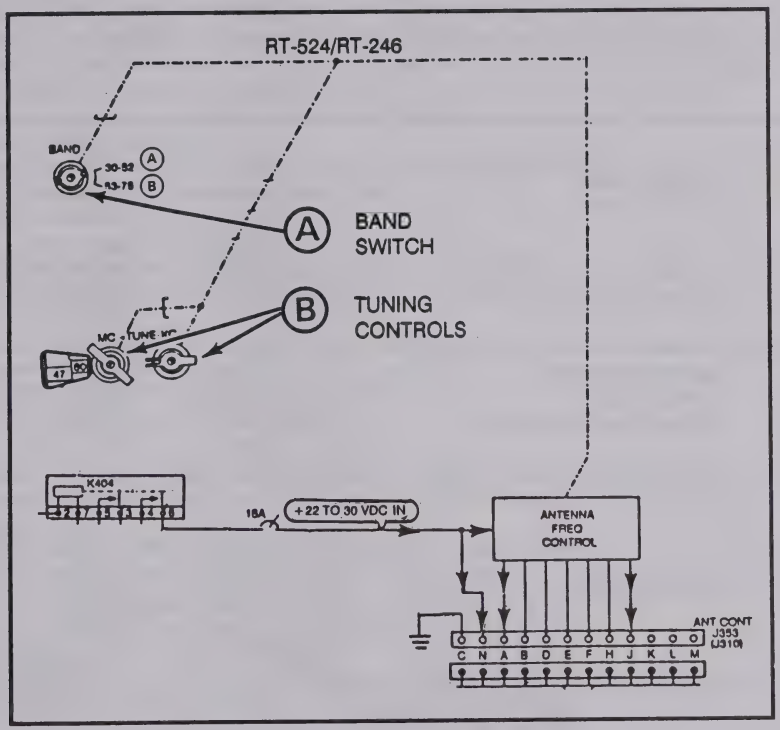


Figure 44. RT unit frequency selecting switches: BAND switch Ⓐ and tuning controls Ⓑ.

(1) The BAND switch is set on the BAND Ⓐ (30-52 MHz). This setting of the BAND switch applies voltage to Pin A of the antenna control jack (J353). The tuning controls (MC-TUNE-KC) are set at a frequency of 47.60 megahertz (MHz). This frequency setting applies a voltage through the antenna frequency control section in the RT to Pin J of the antenna control jack (J353). The voltages present at the RT antenna control jack are applied to jack J2 on the matching unit, through the matching unit DC control cable CX-4722 when plug P2 of the CX-cable is connected to jack J2 on the matching unit. This voltage is applied to the ROTARY SELECTOR and SWITCH SECTION. Both are part of switch S1 in the matching unit and cause the correct tuned circuit to be selected for the RT frequency setting of 47.60 MHz. (See Figure 45.)

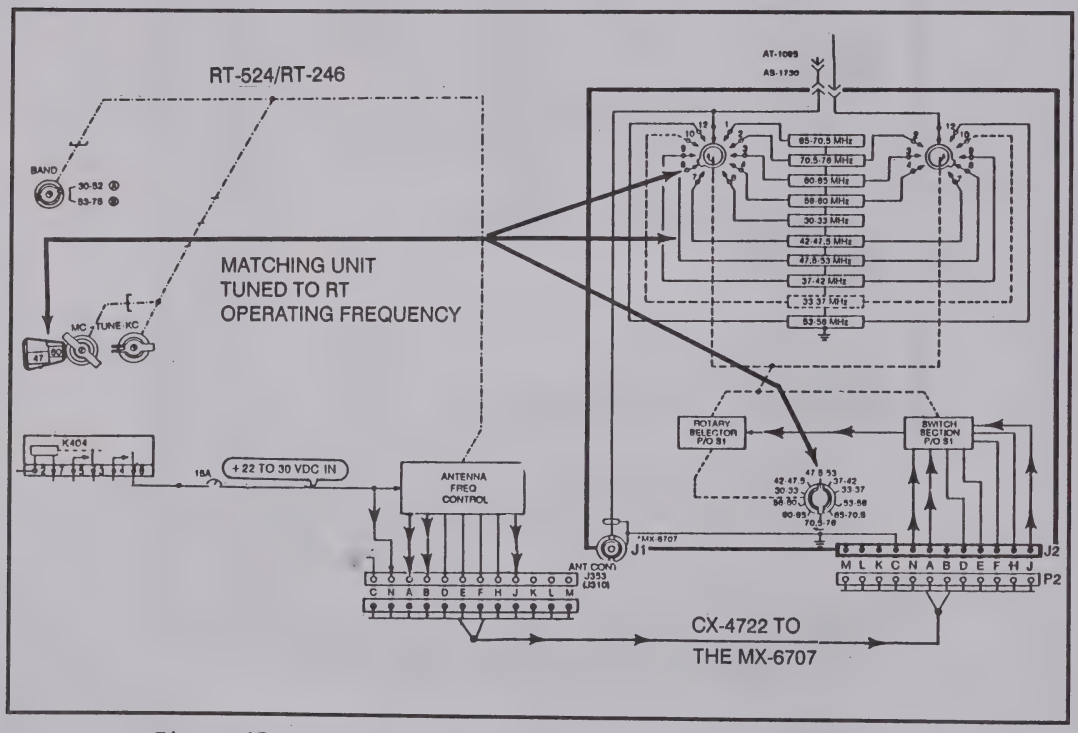


Figure 45. Matching unit control voltage causing matching unit to select the correct tuned circuit.

(2) Notice that the electrical connection to Pin N (inside the RT unit) is made before voltage being applied to the antenna frequency control; that is, when the RT POWER switch is turned to the HIGH or LOW position, there will always be a voltage at Pin N on the antenna control jack J353. Notice also that Pin C of J353 is ground, and Pins K, L, B, and M are not used in the MX-6707 matching unit.

PRACTICE EXERCISES:

10. How many tuning circuits are located within the MX-6707 matching unit?

    a. 6
    b. 8
    c. 10
    d. 12

11. Which controls on the RT unit control application of voltage to the antenna frequency control?

    a. BAND switch
    b. ON/OFF switch, BAND switch, MC-TUNE-KC tuning controls
    c. MC-TUNE-KC control switches
    d. SQUELCH switch

12. Which pins of the antenna control jack J353 are not electrically connected to the antenna frequency control inside the RT unit?

    a. Pins B, M, and H
    b. Pins N, K, and M
    c. Pins M, L, K, and B
    d. Pins L, M, E, and C

13. How is the voltage selected by the position of the RT MC-TUNE-KC tune controls applied to jack J2 of the MX-6707 matching unit?

    a. the RT and the MX-6707 plug into each other
    b. through the CX-4722 cable
    c. through mount MT-1029
    d. through the CG-1773/U cable

14. Which pin of jack J353 on the RT unit supplies ground to the MX-6707 matching unit?

    a. Pin K
    b. Pin M
    c. Pin D
    d. Pin C

//

ANSWERS:

10. c.
11. b.
12. c.
13. b.
14. d.

//

f. The antenna matching unit control voltage chart (see Figure 46) lists the pins of J353 and cable CX-4722 which must have voltage applied to them and the pins which will not have voltage applied to them for different frequency ranges to select a particular antenna tuning circuit.

FREQ MHz	BAND	PIN DESIGNATION							
		N	A	B	D	E	F	H	J
30-33	LOW	24	24	0	24	0	0	0	0
33-37	LOW	24	24	0	0	24	0	0	0
37-42	LOW	24	24	0	0	0	24	0	0
42-47.5	LOW	24	24	0	0	0	0	24	0
47.5-53	LOW	24	24	0	0	0	0	0	24
53-56	HIGH	24	0	24	24	0	0	0	0
56-60	HIGH	24	0	24	0	24	0	0	0
60-65	HIGH	24	0	24	0	0	24	0	0
65-70.5	HIGH	24	0	24	0	0	0	24	0
70.5-76	HIGH	24	0	24	0	0	0	0	24

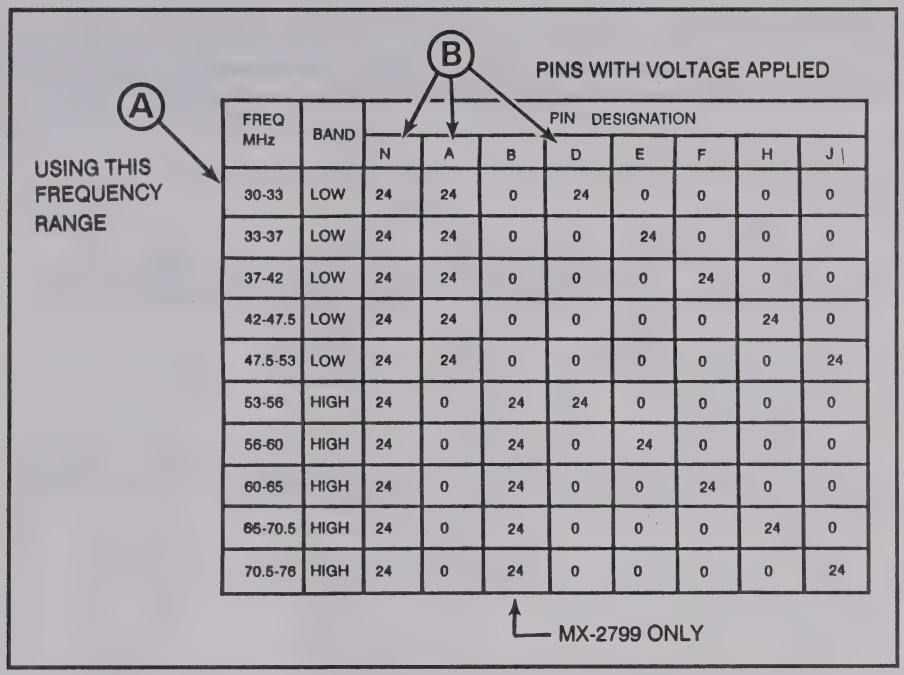
MX-2799 ONLY

Figure 46. Antenna matching unit control voltage chart.

NOTE: Low band = Ⓐ band, and high band = Ⓑ band.

(1) Let us see how this voltage chart is used with the radio set installed, the presets done, and the MC-TUNE-KC tuning controls set to 32.00 MHz.

(a) If the frequency selector switch on the base of MX-6707 turns and stops on the 30-33 MHz setting, the matching unit control circuit for that frequency range is working correctly. (See Figure 47.)



FREQ MHz	BAND	PIN DESIGNATION							
		N	A	B	D	E	F	H	J
30-33	LOW	24	24	0	24	0	0	0	0
33-37	LOW	24	24	0	0	24	0	0	0
37-42	LOW	24	24	0	0	0	24	0	0
42-47.5	LOW	24	24	0	0	0	0	24	0
47.5-53	LOW	24	24	0	0	0	0	0	24
53-56	HIGH	24	0	24	24	0	0	0	0
56-60	HIGH	24	0	24	0	24	0	0	0
60-65	HIGH	24	0	24	0	0	24	0	0
65-70.5	HIGH	24	0	24	0	0	0	24	0
70.5-76	HIGH	24	0	24	0	0	0	0	24

Figure 47. Antenna matching unit control voltage chart.

(b) For the frequency selector switch on the base of the MX-6707 to automatically turn and stop on the frequency range setting of 30-33 MHz, 22 to 30 VDC must be applied to Pins N, A, and D at jack J2 on the bottom of the matching unit.

(2) Let us do one more exercise. If the RT BAND switch is set to the Ⓑ band and the MC-TUNE-KC selector switches are set so that 57.25 MHz is showing on the RT frequency display window and the frequency selector switch on the MX-6707 base turns and stops on the 56-60 MHz position, the matching unit control circuits are working correctly. Referring to the voltage chart above, the FREQ MHz range being used indicates a voltage will have to be on Pins N and E for the correct action to occur. All other pins must have 0 volts.

PRACTICE EXERCISES:

15. (See Figure 46.) For the MX-6707 to select the correct tuned circuit for an operating frequency of 74.65 MHz, voltage must be applied to Pins--

    a. N, A, D, and E.
    b. J, E, H, and L.
    c. N and J.
    d. N, B, and F.

16. (See Figure 46.) For the MX-6707 to select the correct tuned circuit for an operating frequency of 41.50 MHz, voltage must be on Pins--

    a. N, C, B, and H.
    b. N, A, and F.
    c. N, A, and H.
    d. N, A, and J.

17. The antenna matching unit control voltages are applied to which jack on the MX-6707?

    a. J353
    b. J310
    c. J2
    d. J1

18. Which cable applies matching unit control voltages to the MX-6707?

    a. CX-4722
    b. CX-4721
    c. CX-4720
    d. CG-1773

19. Which pin in the antenna control voltage cable is used only when the matching unit is an MX-2799?

    a. Pin L
    b. Pin C
    c. Pin B
    d. Pin A

//

ANSWERS:

    15. c.
    16. b.
    17. c.
    18. a.
    19. c.

//

g. When the voltage applied to the pins of J2 is changed by either the BAND switch or the MC-TUNE-KC controls, the rotary selector switch turns. The two switch segments connecting the tuning circuit to the antenna elements also turn. Each segment turns, one step at a time, until the correct tuned circuit has been selected. (See Figure 48.)

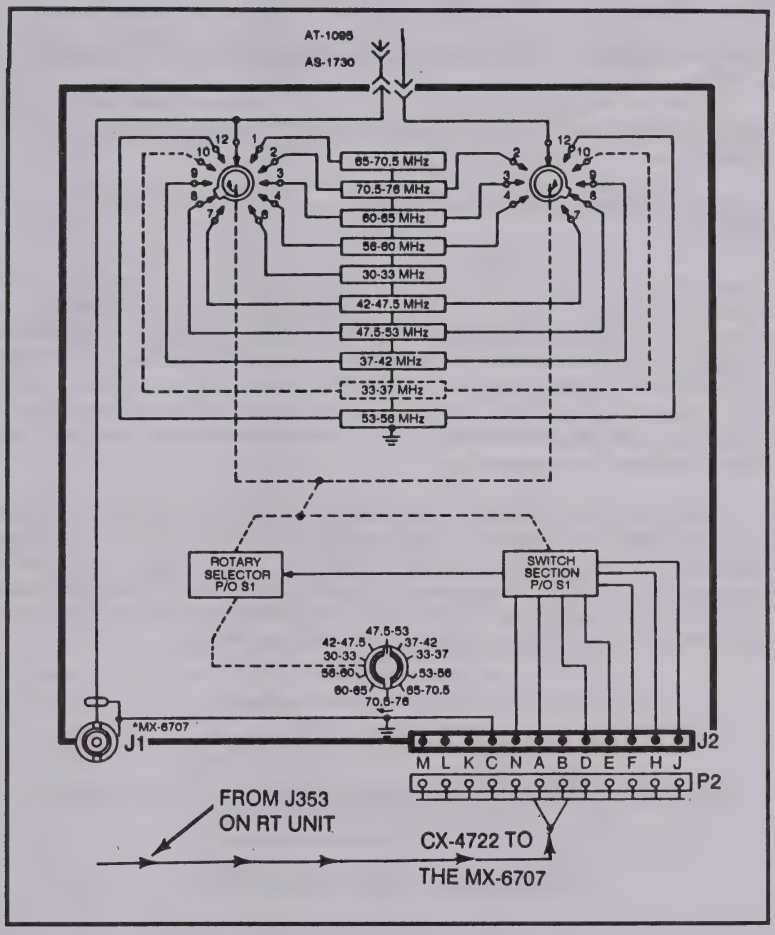


Figure 48. Voltage path for frequency change inside MX-6707.

h. Before discussing the troubleshooting techniques and procedures for a defective matching unit DC voltage control circuit, let us first find out what types of adverse (bad) indications can occur.

(1) No selection: No switching sound is heard at the matching unit when the BAND switch or the MC-TUNE-KC control settings are changed by at least 4 MHz.

(2) Wrong selection: A switching sound is heard at the matching unit, but the MX-6707 selector switch setting does not agree with the RT dial frequency setting.

(3) Continuous selection: The RT POWER switch is set at either LOW or HIGH or, when the MC-TUNE-KC switches are turned, the range switch on the base of the MX-6707 will turn, but it will not stop turning.

NOTE: Two types of circuit defects can cause matching unit DC control circuits to malfunction.

- An open circuit will cause something not to happen when it is supposed to.
- A shorted circuit will cause something to happen before it is supposed to.

i. To evaluate the operation of the matching unit DC control circuit, do the operational checklist steps (EPC): First, do the initial adjustments, verify the radio set installation, do all presets, and cable the test set (AN/PRM-34) to the radio. The operational performance checks will normally be done with the radio set installed in a vehicle. The first EPC step that checks the matching units DC control circuits operation is EPC step 3. A matching unit malfunction can occur in EPC step 1; that is, continuous selection. This abnormal indication could happen when the RT POWER switch is turned on.

(1) When you are checking EPC step 3 of the op check, only two of the previously covered types of abnormal indications can occur--no selection or continuous selection. Let us look at EPC step 3. (Read step 3 of the Appendix, and then return to the text.) When you are doing EPC step 3 to check matching unit control, the only action required is to move the BAND switch to its other position and then back to its original position. (See Figure 49.)

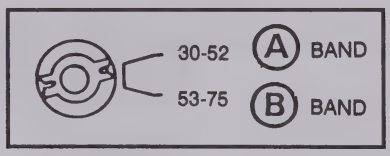


Figure 49. RT unit band switch.

(2) When you are doing EPC step 3, the abnormal indication of no switching sound heard at the MX-6707 will be recorded on a DA Form 2404 as shown in Figure 50.

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38-750; the proponent agency is the Office of the Deputy Chief of Staff for Logistics

1. ORGANIZATION		2. NOMENCLATURE AND MODEL				
3. REGISTRATION/SERIAL/NSN	4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION

7. APPLICABLE REFERENCE			
TM NUMBER	TM DATE	TM NUMBER	TM DATE

COLUMN a — Enter TM item number.

COLUMN b — Enter the applicable condition status symbol.

COLUMN c — Enter deficiencies and shortcomings.

COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X"—Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X"—Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed by until corrective action can be accomplished.

HORIZONTAL DASH "(–)"—Indicates that a inspection, component replacement, maintenance operation check, or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)"—Indicates a materiel defect other deficiency which must be corrected to increase efficiency or to make the item completely operable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL-Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT-Status symbols will be recorded in red.

SAMPLE

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED

TM ITEM NO. a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION	INITIAL WHEN CORRECTED e
3		NO SWITCHING SOUND HEARD AT MX-6707		

DA FORM 1 APR 79 2404 Replaces edition of 1 Jan 64, which will be used

Figure 50. EPC step 3, abnormal indication noted and recorded on DA Form 2404.

(3) To troubleshoot the matching unit DC control circuits with a defect of no selection, first identify the possible bad items of equipment. (See Figure 51.)

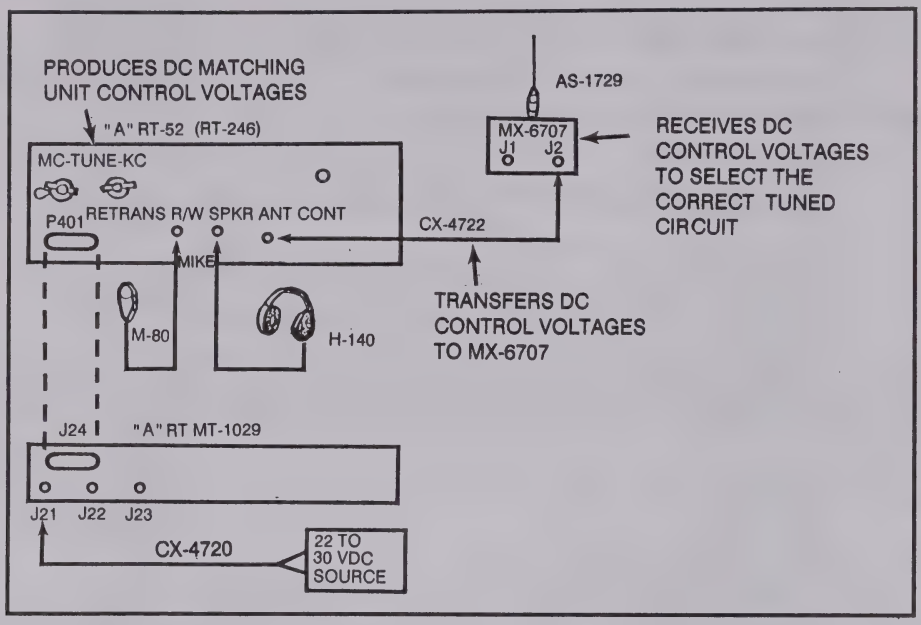


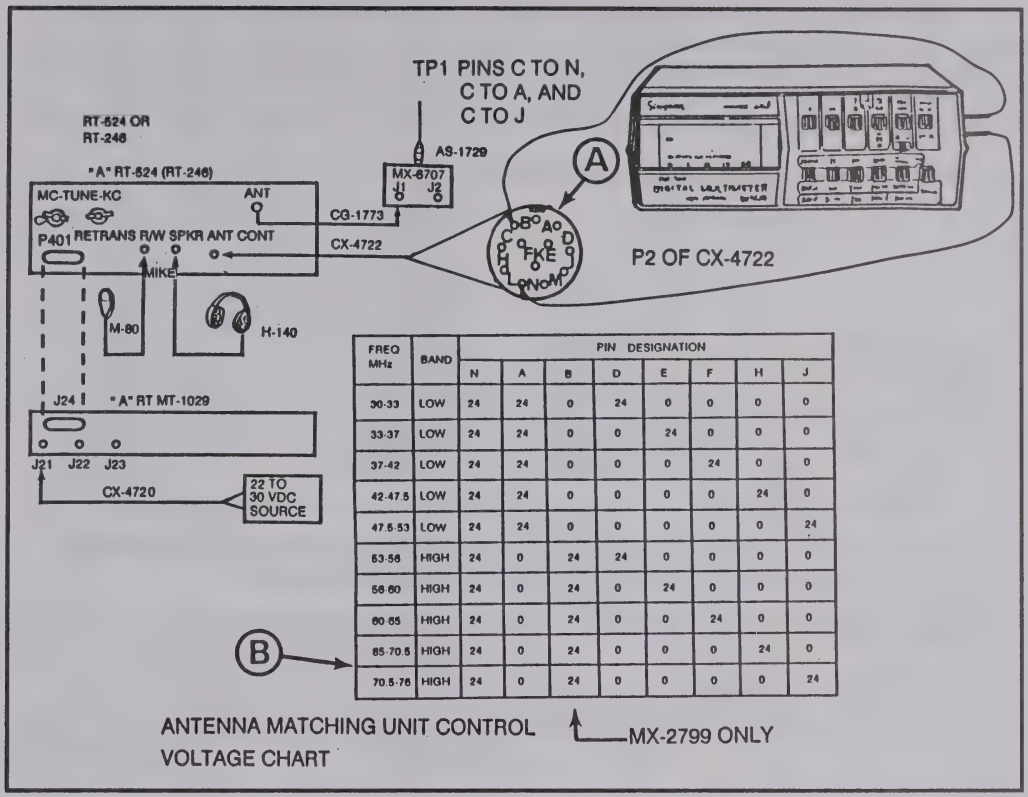
Figure 51. Components and cable used when checking EPC step 3.

(4) The possible bad item(s) of equipment list should be:

- RT unit.
- CX-4722 cable.
- MX-6707.

(5) Since it takes DC voltages to make the EPC step work, the type of test to be made to identify the bad item of equipment is DC voltage measurements.

(6) Let us find out which test points are to be used to make these voltage measurements. First, remove the CX-4722 cable plug from jack J2 on the matching unit, and identify which pins of plug P2 will be measured for DC voltage. Remember, the MC-TUNE-KC tuning controls have not been moved since the presets were done, so the frequency on the RT is 50.00 MHz. (See Figure 52.)

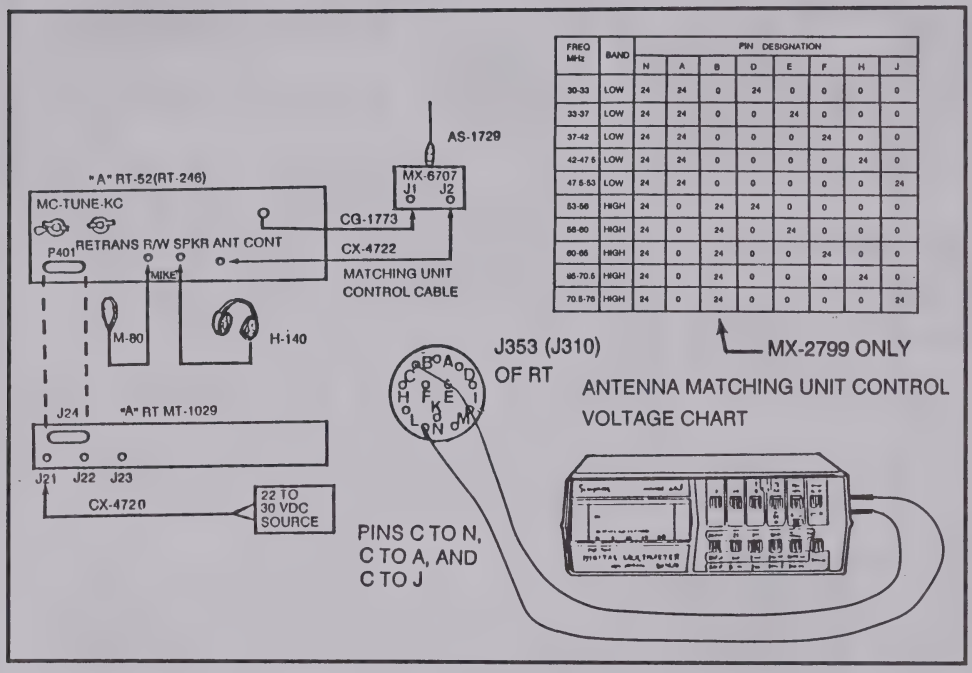


FREQ MHz	BAND	PIN DESIGNATION							
		N	A	B	D	E	F	H	J
30-33	LOW	24	24	0	24	0	0	0	0
33-37	LOW	24	24	0	0	24	0	0	0
37-42	LOW	24	24	0	0	0	24	0	0
42-47.5	LOW	24	24	0	0	0	0	24	0
47.5-53	LOW	24	24	0	0	0	0	0	24
53-56	HIGH	24	0	24	24	0	0	0	0
56-60	HIGH	24	0	24	0	24	0	0	0
60-65	HIGH	24	0	24	0	0	24	0	0
65-70.5	HIGH	24	0	24	0	0	0	24	0
70.5-76	HIGH	24	0	24	0	0	0	0	24

Figure 52. DC control voltage test point and DC control voltage chart (no selection--TP1).

(a) With the multimeter set up to measure DC voltage, place the meter ground (black) probe on Pin C of P2 and the meter DC voltage (red) probe on Pins N, A, and J (one at a time) of P2. Next, set the RT POWER switch at the LOW or HIGH position, and you should read 22 to 30 VDC at TP1, Pins N, A, and J. If the correct voltages are present, this identifies the RT unit and the CX-4722 as being good. The matching unit is bad, and it will be sent to IDS maintenance for repairs.

(b) Let us assume that when you checked voltage at TP1 the meter indicated 22 to 30 VDC on Pins C and J, but the meter indicated 0 volts at pin N. This would tell you that the MX-6707 cannot possibly be defective, but either the CX-4722 cable or the RT unit is defective. To determine which is actually defective, go to TP2 and make voltage checks on Pins N, A, and J. (See Figure 53.)



FREQ MHz	BAND	PIN DESIGNATION							
		N	A	B	D	E	F	H	J
30-33	LOW	24	24	0	24	0	0	0	0
33-37	LOW	24	24	0	0	24	0	0	0
37-42	LOW	24	24	0	0	0	24	0	0
42-47.5	LOW	24	24	0	0	0	0	24	0
47.5-53	LOW	24	24	0	0	0	0	0	24
53-56	HIGH	24	0	24	24	0	0	0	0
56-60	HIGH	24	0	24	0	24	0	0	0
60-66	HIGH	24	0	24	0	0	24	0	0
65-70.5	HIGH	24	0	24	0	0	0	24	0
70.5-76	HIGH	24	0	24	0	0	0	0	24

Figure 53. DC control voltage test point and DC control voltage chart (no selection--TP2).

If a voltmeter reading of 0 volts is obtained at TP2, the RT unit is bad and it will be sent to IDS for repairs. If the voltmeter reads 22 to 30 VDC, this indicates that cable CX-4722 is bad and will be repaired or replaced.

(c) If the CX-4722 cable needs repairs, the actual defect in the cable must be identified. The indication of 0 volts on Pin N at TP1 (P2) and 22 to 30 volts DC on Pins N, A, and J at TP2 (J353) identifies an open circuit between Pin N of P353 and Pin N of P2, through the CX-4722 cable. Whether this circuit is open can be verified by making a continuity check from Pin N on one end of the CX-4722 cable to Pin N on the other end of the CX-4722 cable. (See Figure 54.)

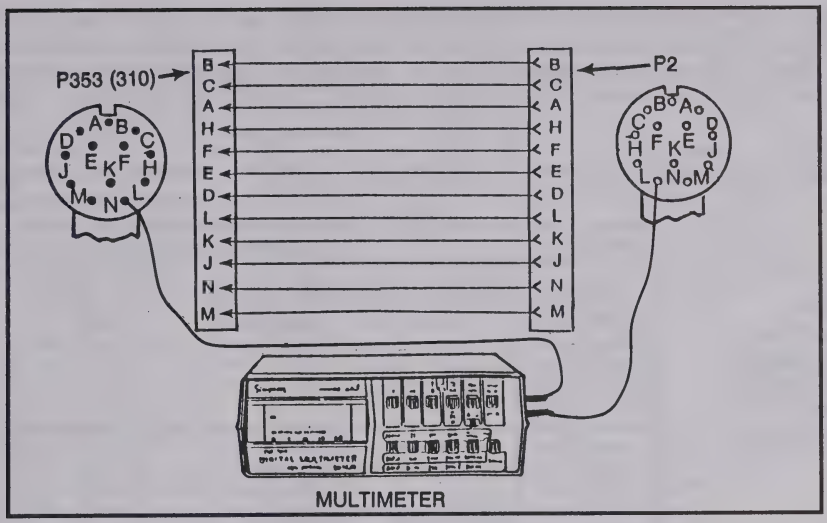


Figure 54. Continuity check from Pin N to Pin N on CX-4722 cable--meter shows an open circuit (actual defect found).

The open circuit found when making the check shown in Figure 54 identifies that the CX-4722 cable must be repaired or replaced.

j. If an adverse condition of continuous switching occurs when checking EPC step 3 (or if it occurs in EPC step 1), the first thing you should do is to turn the RT POWER switch to the OFF position.

(1) Continuous switching occurs when there is a shorted circuit in the matching unit DC control circuits that is allowing a voltage to reach the matching unit that is not supposed to. The possible bad items of equipment list is the same as when no switching occurs: the RT unit, the CX-4722 cable, and the MX-6707 matching unit.

(2) The voltage chart shown below indicates which pins should have 22 to 30 VDC on them by frequency ranges. It also indicates which pins should have no (0) voltage on them. The abnormal indication of continuous switching indicates that one or more of the pins that should have 0 volts have 22 to 30 VDC on them. (See Figure 55.)

RANGE COVERING FREQUENCY SET ON RT UNIT: 50 - 00 MHz

FREQ MHz	BAND	PIN DESIGNATION							
		N	A	B	D	E	F	H	J
30-33	LOW	24	24	0	24	0	0	0	0
33-37	LOW	24	24	0	0	24	0	0	0
37-42	LOW	24	24	0	0	0	24	0	0
42-47.5	LOW	24	24	0	0	0	0	24	0
47.5-53	LOW	24	24	0	0	0	0	0	24
53-56	HIGH	24	0	24	24	0	0	0	0
56-60	HIGH	24	0	24	0	24	0	0	0
60-65	HIGH	24	0	24	0	0	24	0	0
65-70.5	HIGH	24	0	24	0	0	0	24	0
70.5-76	HIGH	24	0	24	0	0	0	0	24

MX-2799 ONLY

Figure 55. Antenna matching unit control voltage chart.

(3) If a frequency of 50.00 MHz is set on the RT unit, the voltage chart shows that Pins N, A, and J should have 22 to 30 VDC, and Pins B, D, E, F, and H should have 0 voltage. The type of measurement that must be made is voltage measurements. The test points are shown on Figure 56.

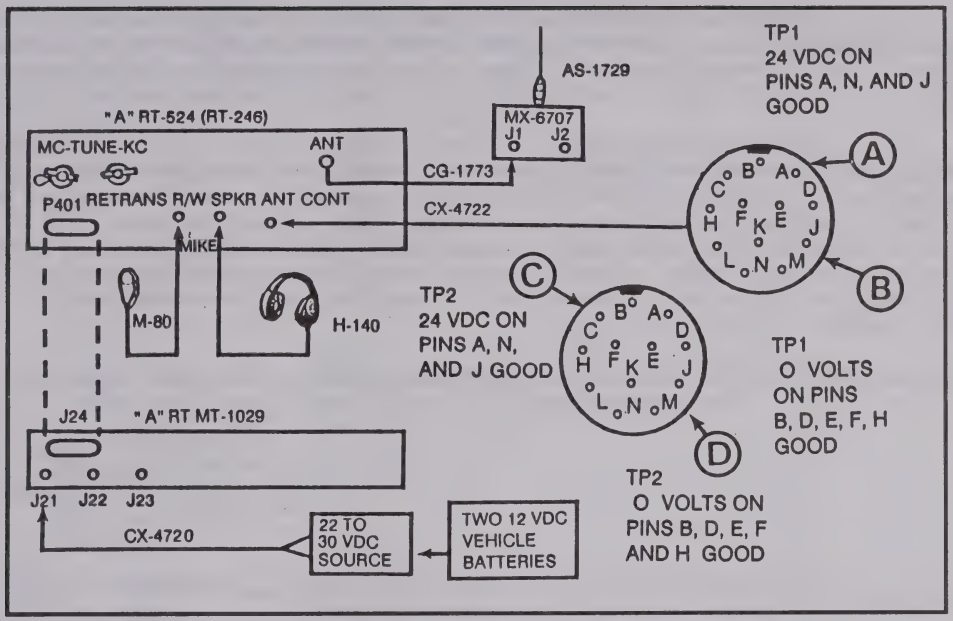


Figure 56. Matching unit DC control voltage test point (listed with good readings only).

(a) When checking TP1, a voltage is measured on one of the pins that should have 0 volts. This would identify the MX-6707 as a good item of equipment and at the same time indicate that the shorted circuit is in either the CX-4722 cable or the RT unit. However, if the voltage measurements of all the pins on TP1 agree with the voltage chart readings, the MX-6707 is bad and will be sent to IDS for repairs with a completed DA Form 2407.

(b) If it is determined from the voltage measurements that the RT unit is bad, it will be sent to IDS for repairs. However, if it is determined that the CX-4722 voltage control cable is the bad item of equipment; that is, all voltage measurements at the RT antenna control jack J353 were correct, then the CX-4722 cable will be repaired or replaced.

(4) To determine the actual defect in the CX-4722 cable so it can be repaired, you make shorts tests on the cable to identify which wires are touching. Remember, continuous switching is caused by a voltage being applied to the MX-6707 that should not be.

(a) Let us say that when you measured voltage on TP1 a voltage was found on Pin H where there was not supposed to be a voltage, all other measurements at TP1 and P2 were correct, and all of the voltage measurements at TP2 J353 were correct.

(b) (See Figure 57.) To identify which circuit in the cable that has voltage on it is touching the Pin H circuit within the cable, you must make the following checks. To test the CX-4722 cable for a possible short, first place one of the meter leads on the pin that had a voltage (that was not supposed to); in this case Pin H. Now take the other test lead and touch Pins N, A, and J one at a time. When one of these pins (when touched) causes the multimeter needle to move to 0, that pin wire in the cable is the one that is touching the Pin H wire; that is, shorted together. (See Figure 57.)

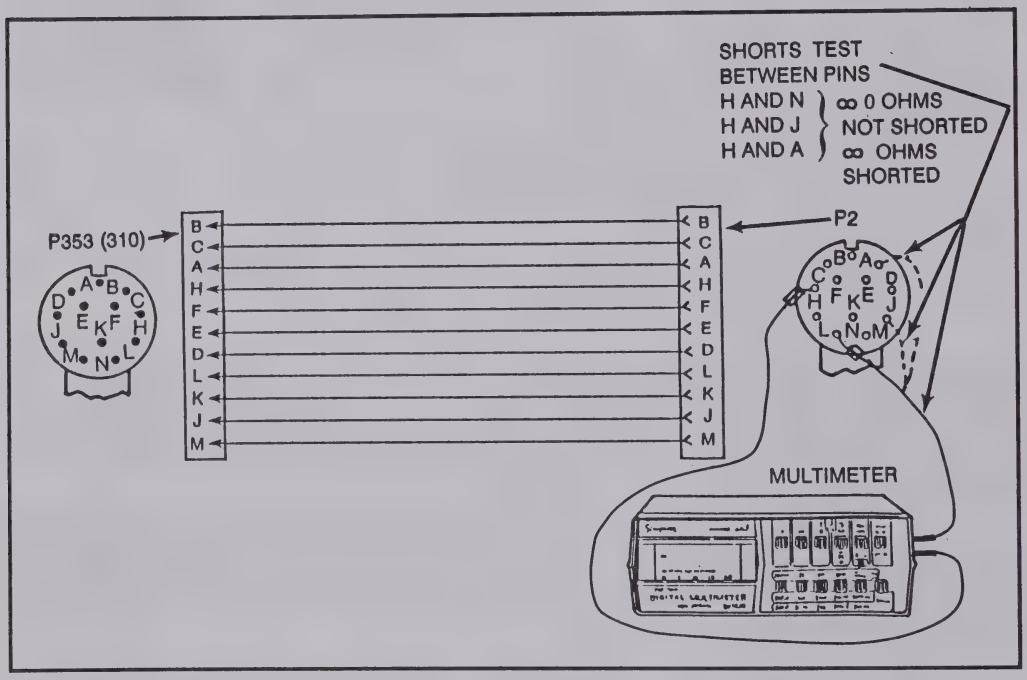


Figure 57. CX-4722 removed from RT unit and MX-6707 and multimeter setup for shorts test.

PRACTICE EXERCISES:

20. Which of the following must be done before doing the op check EPC steps?

    a. initial adjustments
    b. installation verification
    c. presets and cabling of test set
    d. all of the above

21. The two types of circuit defects that can cause a matching unit DC control voltage circuit to malfunction are an _____ and a _____.

22. The two abnormal indications that can occur in EPC step 3 are _____ selection and _____ selection.

23. Which switch on the RT unit is used to check initial matching unit (MX) control?

    a. light switch
    b. POWER switch
    c. BAND switch
    d. speaker switch

24. (See Figure 55.) With a frequency of 38.95 MHz set on the RT, which pins should have 22 to 30 VDC applied to them?

    a. Pins N, A, and D
    b. Pins N, A, and F
    c. Pins N, A, and J
    d. Pins N, B, and H

//

ANSWERS:

20. d.
21. open, short
22. no, continuous
23. c.
24. b.

//

k. EPC step 14, High-Level RF Transmit Power and Frequency Accuracy, also is used to evaluate the antenna matching unit DC control circuits. It is used to check every frequency range in the MX-6707 (10 frequency ranges). To check EPC step 14, an additional DA Form 2404 has been prepared. (See Figure 58.)

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET
For use of this form see TM 38 750 the proponent agency is the Office of the Deputy Chief of Staff for Logistics.

1 ORGANIZATION (RT SERIAL NO.)		2 NOMENCLATURE AND MODEL		
3 REGISTRATION/SERIAL NSN	4a MILES	b (RT MODEL NO (e.g. RT-524, RT-246))	5 DATE	6 TYPE INSPECTION
7				
TM NUMBER	TM DATE	TM NUMBER		

COLUMN a — Enter TM item number.

COLUMN b — Enter the applicable condition status symbol.

COLUMN c — Enter deficiencies and shortcomings.

COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X" — Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X" — Indicates a deficiency, however, the equipment may be operated under specific limitations directed by higher authority or as prescribed until corrective action can be accomplished.

HORIZONTAL DASH "(-)" — Indicates that a required inspection, component replacement, maintenance operation check or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)" — Indicates a material defect other than a deficiency which must be corrected to increase deficiency or to make the item completely serviceable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT Status symbols will be recorded in red.

SAMPLE

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED

TM ITEM NO a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
(1.)	75.00	a.____ b.____ FWD RVS c.____ MHz	(6.) 21.45 a.____ b.____ FWD RVS c.____ MHz	
(2.)	67.05	a.____ b.____ FWD RVS c.____ MHz	(7.) 35.60 a.____ b.____ FWD RVS c.____ MHz	
(3.)	62.20	a.____ b.____ FWD RVS c.____ MHz	(8.) 39.65 a.____ b.____ FWD RVS c.____ MHz	
(4.)	58.25	a.____ b.____ FWD RVS c.____ MHz	(9.) 44.80 a.____ b.____ FWD RVS c.____ MHz	
(5.)	54.40	a.____ b.____ FWD RVS c.____ MHz	(10.) 50.85 a.____ b.____ FWD RVS c.____ MHz	

DA FORM 1 APR 79 2404 Replaces edition of 1 Jan 64 which will be used

Figure 58. Additional DA Form 2404 to be used when checking EPC step 14.

(1) If the test set AN/PRM-34 is being used to do the op check, it should already have been connected to the RT unit configuration. (See Figure 59.)

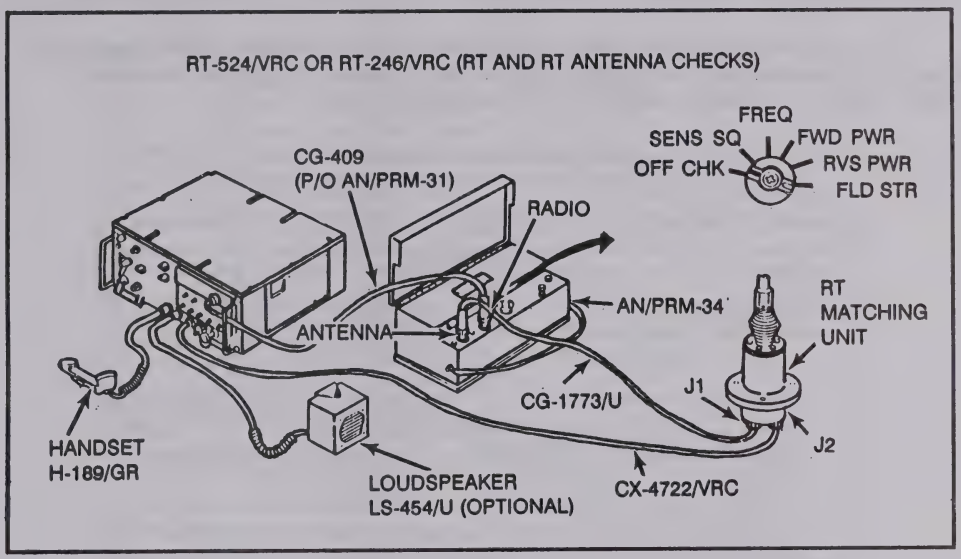


Figure 59. RT unit and AN/PRM-34 cabling diagram.

(2) (Read step 14 of the Appendix, and then return to the text.) When doing step 14, perform the setup instructions and observe the NOTE and CAUTION directions. Using the test set AN/PRM-34 and the frequencies listed on the additional DA Form 2404, all frequency checks should be within the tolerance of plus or minus 4 kilohertz (kHz) of the RT dial frequency setting. Any of the previously mentioned abnormal indications: 1--no selection, 2--wrong selection, or 3--continuous selection, can occur in this EPC step.

NOTE: When checking EPC step 14 and an abnormal indication of 1--no selection, 2--wrong selection, or 3--continuous selection occurs, you will use the same troubleshooting procedure you used when these abnormal indications occurred in EPC step 3.

(3) Let us say that when checking EPC step 14 using the frequencies listed on the prepared DA Form 2404 (Figure 58), you obtained the abnormal indication listed on the DA Form 2404 in Figure 60.

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38 750; the proponent agency is the Office of the Deputy Chief of Staff for Logistics.

1. ORGANIZATION				2. NOMENCLATURE AND MODEL		
3. REGISTRATION/SERIAL/NSN	4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION

7. APPLICABLE REFERENCE			
TM NUMBER	TM DATE	TM NUMBER	TM DATE

COLUMN a — Enter TM item number.
COLUMN b — Enter the applicable condition status symbol.
COLUMN c — Enter deficiencies and shortcomings.
COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.
COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X"—Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X"—Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed [illegible] until corrective action can be accomplished.

HORIZONTAL DASH "(–)"—Indicates that a [illegible] inspection, component replacement, maintenance operation check, or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)"—Indicates a materiel defect other than deficiency which must be corrected to insure efficiency or to make the item completely serviceable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL-Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT-Status symbols will be recorded in red.

SAMPLE

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED

TM ITEM NO. a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
14		NO SELECTION ON FREQUENCY SETTING 67.05 MHz.		

DA FORM 1 APR 79 2404 — Replaces edition of 1 Jan 64, which will be used

Figure 60. EPC Step 14--abnormal indication.

(a) The first action you take is to turn the RT POWER switch off, then remove CX-4722 cable plug P2 from the MX-6707 jack J2. Using the antenna matching unit control voltage chart, identify which pins must have voltage on them to make the MX-6707 match the RT dial frequency of 67.05 MHz. (See Figure 61.)

FREQ MHz	BAND	PIN DESIGNATION							
		N	A	B	D	E	F	H	J
30-33	LOW	24	24	0	24	0	0	0	0
33-37	LOW	24	24	0	0	24	0	0	0
37-42	LOW	24	24	0	0	0	24	0	0
42-47.5	LOW	24	24	0	0	0	0	24	0
47.5-53	LOW	24	24	0	0	0	0	0	24
53-56	HIGH	24	0	24	24	0	0	0	0
56-60	HIGH	24	0	24	0	24	0	0	0
60-65	HIGH	24	0	24	0	0	24	0	0
65-70.5	HIGH	24	0	24	0	0	0	24	0
70.5-76	HIGH	24	0	24	0	0	0	0	24

67.05 MHZ RANGE

MX-2799 ONLY

Figure 61. Antenna matching unit control voltage chart.

(b) As the voltage chart indicates, Pins N and H should have a voltage on them to cause the matching unit to select on a frequency setting of 67.05 MHz.

(c) Earlier, we realized that only an open circuit would not let an action occur when it is supposed to. In this case, one of the wires used to control the frequency matching for 67.05 MHz must be open. The same troubleshooting techniques and procedures used to identify the defect of no selection in EPC step 3 are used now to identify the actual circuit defect.

(4) Two conclusions should be realized at this point; they are:

(a) No selection and wrong selection are indications of an action not occurring when it is supposed to; that is, a circuit is open. An open circuit is found by using the same troubleshooting technique and procedure that was used for these indications in EPC step 3.

(b) Continuous selection is an indication of an action occurring before it is supposed to; that is, two wires are touching that are not supposed to touch. The troubleshooting technique and procedure to identify a short is the same that was used in EPC step 3.

1. (Read step 12 of the Appendix, and then return to the text.) EPC step 12 checks RT-246 remote frequency selection.

(1) See Figure 62. If step 12 is bad, any of the abnormal indications listed on this DA Form 2404 could occur.

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38-750; the proponent agency is the Office of the Deputy Chief of Staff for Logistics

1. ORGANIZATION					2. NOMENCLATURE AND MODEL	
3. REGISTRATION/SERIAL/NSN	4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION

7. APPLICABLE REFERENCE			
TM NUMBER	TM DATE	TM NUMBER	TM DATE

COLUMN a — Enter TM item number.

COLUMN b — Enter the applicable condition status symbol.

COLUMN c — Enter deficiencies and shortcomings.

COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X"—Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X"—Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed [illegible] until corrective action can be accomplished.

HORIZONTAL DASH "(–)"—Indicates that a [illegible] inspection, component replacement, maintenance operation check, or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)"—Indicates a materiel defect other than deficiency which must be corrected to increase efficiency or to make the item completely operable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL-Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT-Status symbols will be recorded in red.

SAMPLE

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED

TM ITEM NO. a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
12		MATCHING UNIT		
		WILL NOT SWITCH		
		ON FREQUENCY		
		———.		
		(OR)		
12		MATCHING UNIT SWITCHES		
		BUT STOPS ON WRONG		
		FREQUENCY.		
		(OR)		
12		MATCHING UNIT		
		WILL NOT STOP		
		SWITCHING ON		
		FREQUENCY———.		

DA FORM 1 APR 79 2404 — Replaces edition of 1 Jan 64, which will be used

Figure 62. EPC step 12--possible bad indications.

(a) If an abnormal indication of matching unit will not select or matching unit switches but stops on the wrong frequency range occurs, you would troubleshoot both by using the same troubleshooting techniques and procedures. Before checking EPC step 12, the channel settings for this step should be set in accordance with the frequency checklist shown on the DA Form 2404 in Figure 63. Before the actual bad item can be found, the possible bad items of equipment must be identified--in this case, the RT-246, the CX-7059 cable, and the C-2742 control box.

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form see TM 38 750 the proponent agency is the Office of the Deputy Chief of Staff for Logistics.

1 ORGANIZATION		2 NOMENCLATURE AND MODEL			
3 REGISTRATION/SERIAL NSN	4a MILES	b RT MODEL NO (e.g. RT-524, RT-246)	5 DATE	6 TYPE INSPECTION	
7					
TM NUMBER	TM DATE	TM NUMBER			

RT SERIAL NO

COLUMN a — Enter TM item number.

COLUMN b — Enter the applicable condition status symbol.

COLUMN c — Enter deficiencies and shortcomings.

COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X" — Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X" — Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed locally, until corrective action can be accomplished.

HORIZONTAL DASH "(-)" — Indicates that a rn tion, component replacement, maintenance oper ...neck or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)" — Indicates a material defect other then a deficiency which must be corrected to increase deficiency or to make the item completely ...nceable.

...AST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT Status symbols will be recorded in red.

SAMPLE

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED

TM ITEM NO a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
(1)	75.00	a.____ b.____ FWD AVS c.____MHz	(6) 31.45 a.____ b.____ FWD AVS c.____MHz	
(2)	87.05	a.____ b.____ FWD AVS c.____MHz	(7) 35.80 a.____ b.____ FWD AVS c.____MHz	
(3)	62.20	a.____ b.____ FWD AVS c.____MHz	(8) 39.65 a.____ b.____ FWD AVS c.____MHz	
(4)	58.25	a.____ b.____ FWD AVS c.____MHz	(9) 44.80 a.____ b.____ FWD AVS c.____MHz	
(5)	54.40	a.____ b.____ FWD AVS c.____MHz	(10) 50.85 a.____ b.____ FWD AVS c.____MHz	

CHANNEL FREQUENCY SETTINGS CHANNEL

DA FORM 1 APR 79 2404 Replaces edition of 1 Jan 64 which will be used

Figure 63. RT-246 channel frequency presets.

(b) First, disconnect the CX-7059 cable from the C-2742 jack J71. Second, identify which circuit is used to make Channel 1 operate. (See Figure 64.)

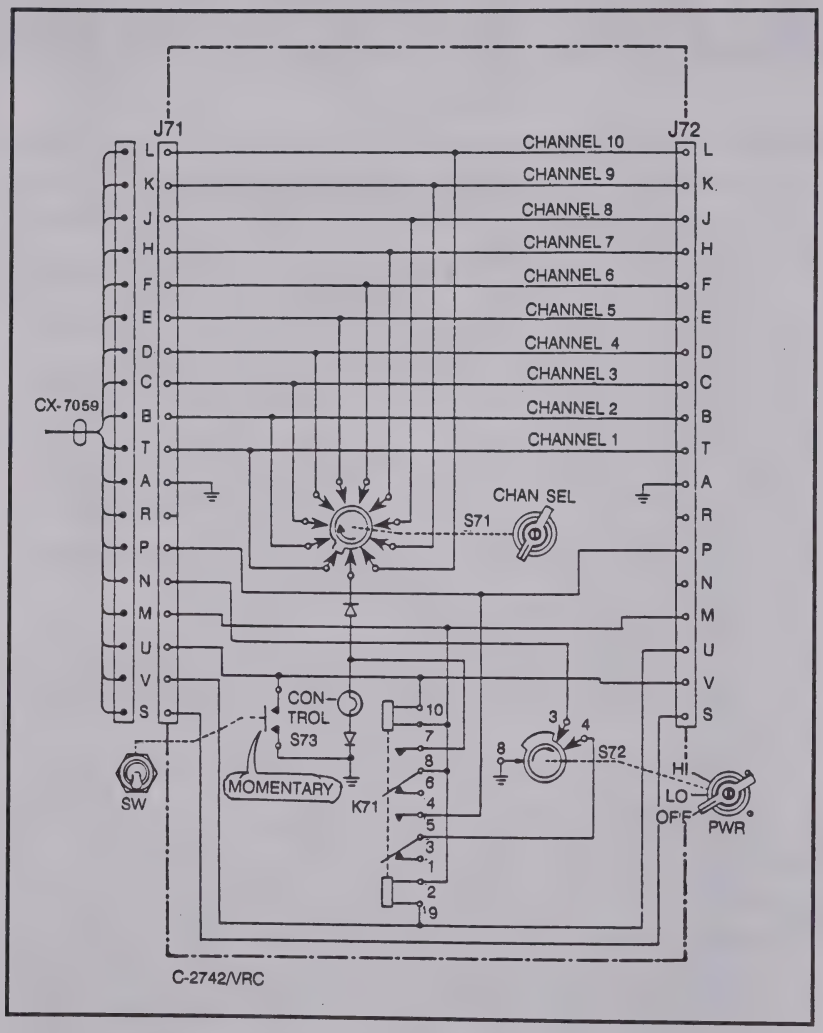


Figure 64. C-2742 and CX-7059 channel circuit pins.

(c) (See Figure 65.) With the POWER switch turned OFF, identify Pins M and T on the CX-7059 cable plug P71. Using a jumper (wire), short Pin M and Pin T, and turn the RT POWER switch to REMOTE. If the MX-6707 now selects correctly, the C-2742 is bad and it must be sent to IDS maintenance for repair, with a completed DA Form 2407.

CAUTION

MAKE SURE THAT THE JUMPER (WIRE) USED TO SHORT ANY TWO CIRCUITS IS AN INSULATED WIRE, NOT A BARE WIRE.

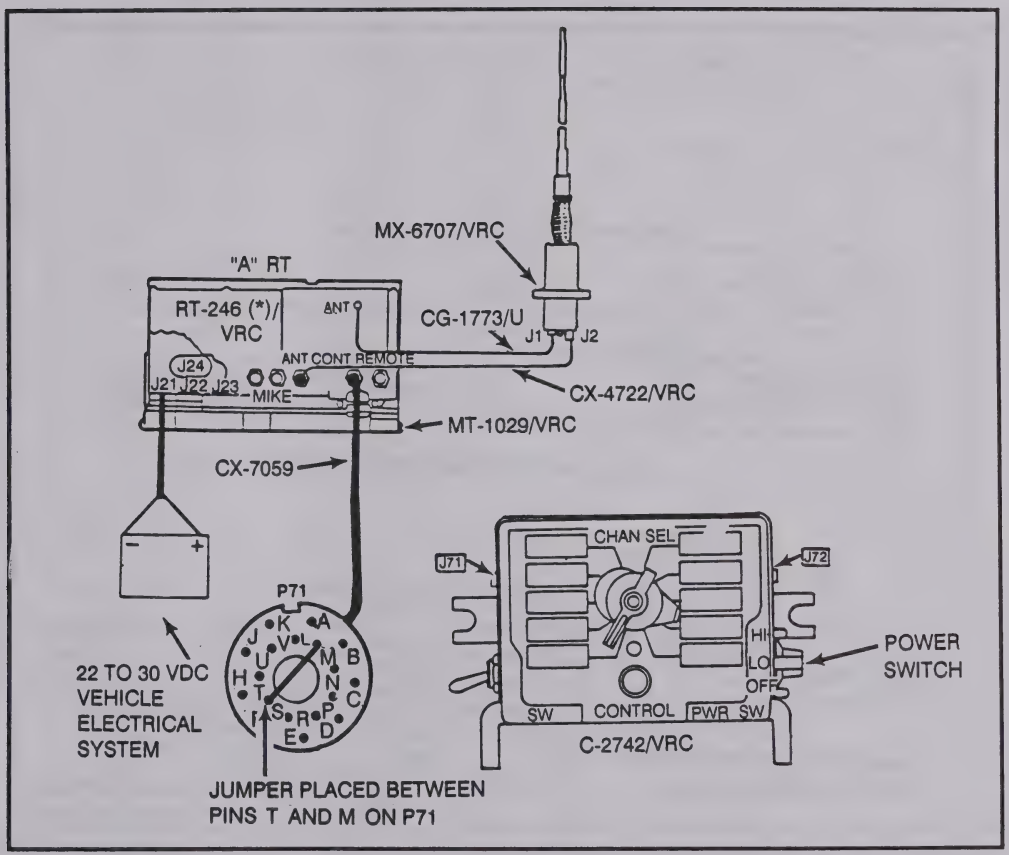


Figure 65. Short placed between Pins M and T, voltage control circuit on CX-7059 plug P71.

(d) (See Figure 66.) If the MX-6707 still does not select, turn the RT POWER switch off and unplug CX-7059 plug P306. Short Pin M to Pin A at J306 on the RT, and turn the RT POWER switch to REMOTE. If MX-6707 fails to select, the RT is bad and must be turned in to IDS maintenance with a DA Form 2407. If it selects, CX-7059 is bad and must be replaced or repaired. Check CX-7059 Pin A at P306 to Pin T of P71 for an open. This will be the problem with the CX-7059, as an open M to M would already have been found.

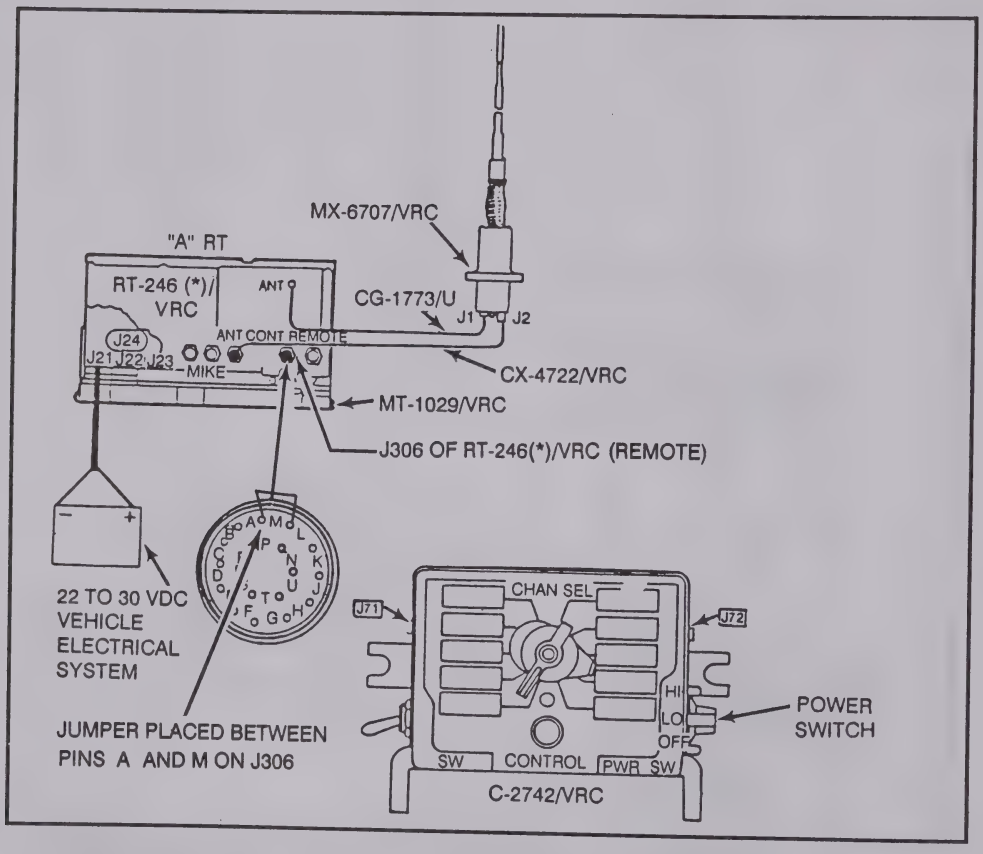


Figure 66. Short placed on voltage control circuit or RT remote control jack J306, Pin A and Pin M.

(2) If, when checking EPC step 12, the abnormal indication is continuous switching, the possible bad items of equipment are the RT-246, the CX-7059 cable, and the C-2742 control box.

(a) To identify the actual bad item, you must make shorts and ohms checks. First, leave the setting of the channel selector switch on the C-2742 set on the channel setting where continuous selection occurred. Second, disconnect the CX-7059 cable from the C-2742 jack J71, and position a jumper from Pin C to Pin M of P71. If the MX-6707 selects properly, the C-2742 is bad and must be sent to IDS maintenance with a DA Form 2407. (For this example, Channel 3 is being used.) (See Figure 67.)

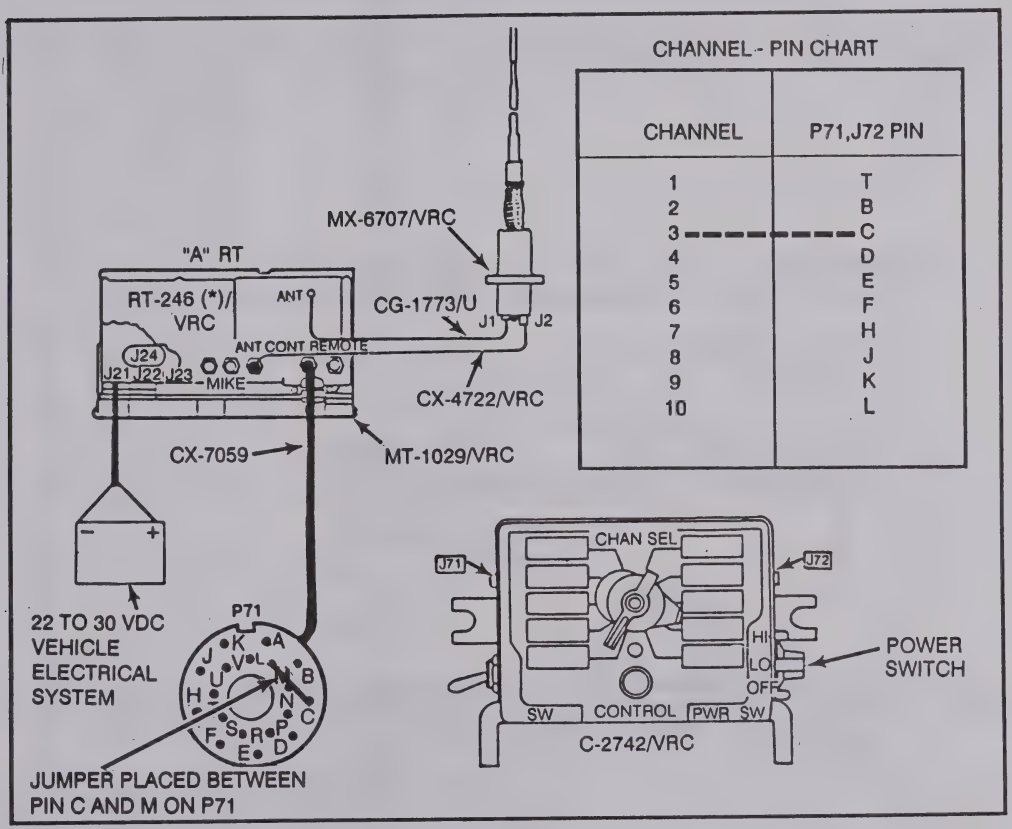


Figure 67. Short (jumper) applied on Channel 3 voltage control circuit, P71.

(b) The channel-pin chart in Figure 67 identifies that Pin C is the pin at plug P71 that is applying control voltage from the C-2742; therefore, only Pin C of plug P71 should apply 22 to 30 VDC to the RT. If you still have continuous selection, remove CX-7059, P306, from RT J306. If MX-6707 selects properly when the jumper is placed between Pins C and M of J306, the short is in the CX-7059 from Pin C to one or more of the other control pins and must be repaired or replaced. If the RT continues to select with the jumper from C to M, the RT is bad and must be sent to IDS maintenance with a DA Form 2407.

(3) See Figure 68. To identify which of these items is bad, the CX-7059 must be disconnected from the RT remote jack J306. A shorts check from Pin C to the other control pins at J306 for the RT or J71 for the C-2742 will identify the other pins to which Pin C is shorted.

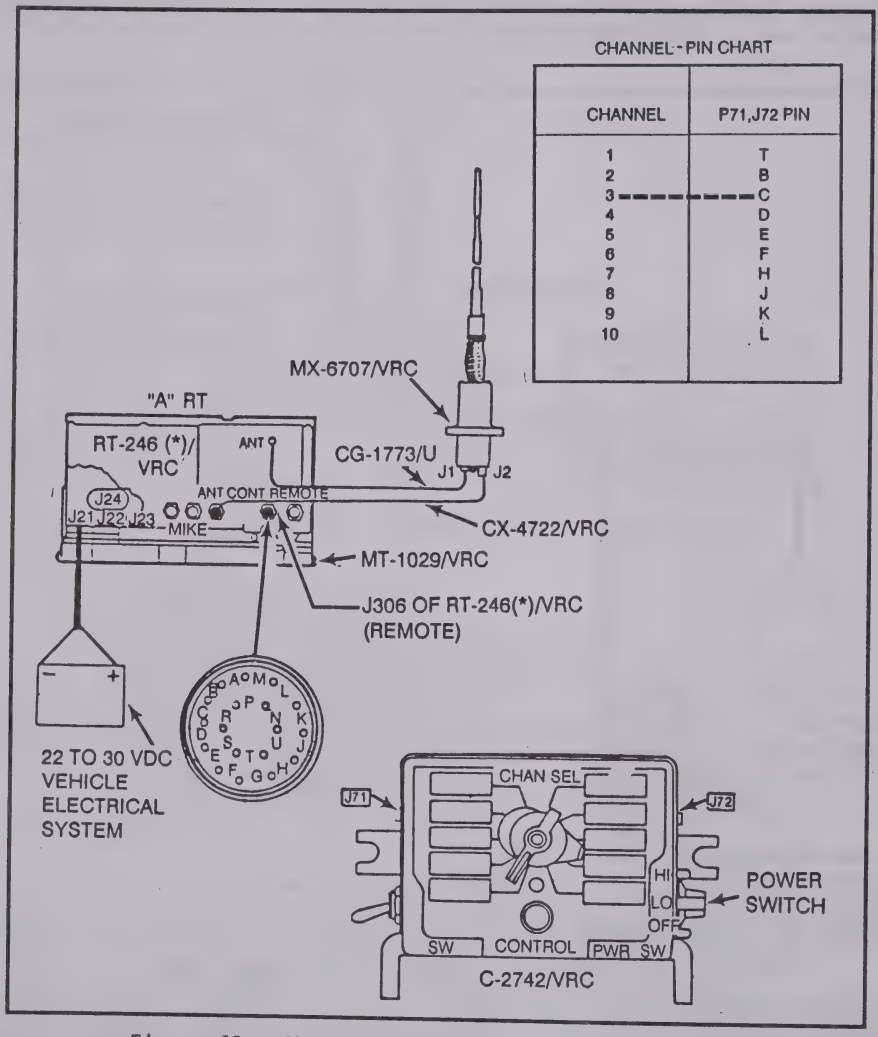


Figure 68. Shorts test of Pin C on jack J306.

PRACTICE EXERCISES:

25. EPC step 14 checks which of the following?

    a. low-level RF transmit power
    b. low-level RF transmit power and frequency accuracy
    c. high-level RF transmit power
    d. high-level RF transmit power and frequency accuracy

26. (See Figure 59.) Which cable, when you use test set AN/PRM-34 to check the radio set operation, is connected between the RT antenna control jack and jack J2 of the MX-6707?

    a. CG-409
    b. CG-1773
    c. CX-4722
    d. CX-4723

27. When you check frequency accuracy in EPC step 14, the AN/PRM-34 display must indicate the RT dial frequency setting within--

    a. (±) 2 kHz.
    b. (±) 4 kHz.
    c. (±) 6 kHz.
    d. (±) 8 kHz.

28. The abnormal indications of no selection and wrong selection when checking EPC step 14 can only be caused by--

    a. an open circuit.
    b. a shorted circuit.
    c. a reversed circuit.
    d. none of the above.

29. (See Figure 61.) When you check frequency accuracy, which matching unit control voltage circuits (pins) should have 22 to 30 VDC on them when a frequency of 38.95 MHz is set on the RT unit?

    a. Pins N, A, and B
    b. Pins N, B, and D
    c. Pins N, A, and E
    d. Pins N, A, and F

30. (See Figure 61.) Which pins in the antenna control circuits should have 22 to 30 VDC on them when the RT unit frequency is set on 72.30 MHz?

    a. Pins N, A, and J
    b. Pins N, B and H
    c. Pins N, B and J
    d. Pins N, A and F

31. (See Figure 61.) Which pins at jack J2 (TP1) of the antenna control voltage circuits should have 0 volts on them if the RT dial frequency is 54.40 MHz?

a. A, E, F, H, and J
b. A, D, F, H, and J
c. B, E, F, H, and J
d. B, D, F, H, and J

//

ANSWERS:

25. d.
26. c.
27. b.
28. a.
29. d.
30. c.
31. a.

//

13. SUMMARY. Now that you have completed the matching unit DC control voltage circuits learning event, you should understand the purpose and operation of these circuits. You were shown how to troubleshoot these circuits when an adverse condition was found; that is, how to identify the defective component or cable and what actions and maintenance forms are required for needed repairs. Applying the skills and knowledge learned in this learning event, you will be able to troubleshoot and correct any fault that could possibly occur in the AN/VRC-12 series radio secure with COMSEC equipment matching units DC control circuits.

LEARNING EVENT III

System Troubleshoot AN/VRC-12 Series Radio Set With COMSEC Equipment Receive Signal Path to a Defective Component, Cable, or Accessory

14. TROUBLESHOOT RT-524 OR RT-246 AND THE R-442 RECEIVE SIGNAL PATH CIRCUITS. In this learning event, you will learn how to troubleshoot the RT-524 or the RT-246 and the R-442 receive signal path circuits to identify a defective component, cable, or accessory. Then, you will learn what your repair responsibilities are for a bad radio component, its mount, its interface cables, and its audio accessories. An important element that will emerge from this learning event is that the same troubleshooting techniques and procedures that apply to one of the radio components receive signal path circuit apply equally to all radio components receive paths.

a. Upon completion of this learning event, you will have learned, when using an AN/PSM-45 multimeter, how to--

- Check the audio circuit of associated audio accessories by circuit disturbance.
- Isolate defects to either the radio component or its mount.
- Check the AN/VRC-12 antennas through continuity checks.

b. To accomplish these objectives, you must know--

- What each component, cable, and accessory of the receive signal path is designed to do.
- How to use diagrams to identify possible bad items of a faulty receive signal path circuit.
- Which test points are used to check each item identified.
- How to use the AN/PSM-45 multimeter to system troubleshoot to find the actual bad item of equipment.

c. Each radio component has a receive signal path consisting of the radio component, RT-524, RT-245, or R-442; its antenna and audio accessories; and its mount and interface cables. All are necessary to receive and apply the received signal to the radio components audio reproduces. To be a receiver, the RT must not be keyed. If the RT is keyed, it will only function as a transmitter. Additionally, the RT receive signal path can operate in any position of its squelch switch.

d. (See Figure 69.) There are four basic components required for FM reception:

- A power source Ⓐ.
- An FM receiver Ⓑ.
- An antenna Ⓒ.
- An audio reproducer Ⓓ.

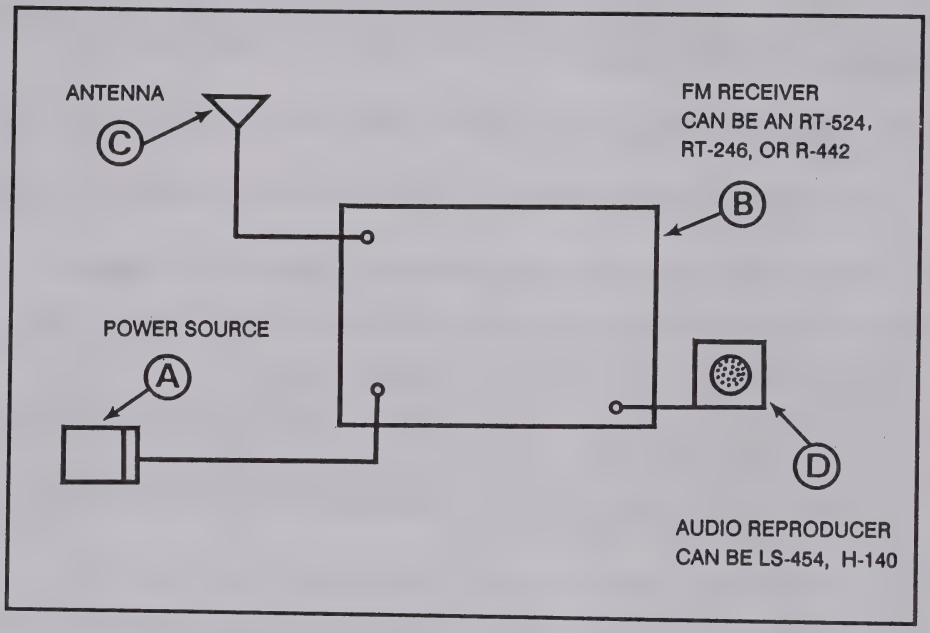


Figure 69. Basic components for FM reception.

(1) Let us compare the basic components with the AN/VRC-12 series radio configuration, the AN/VRC-47. (See Figure 70.)

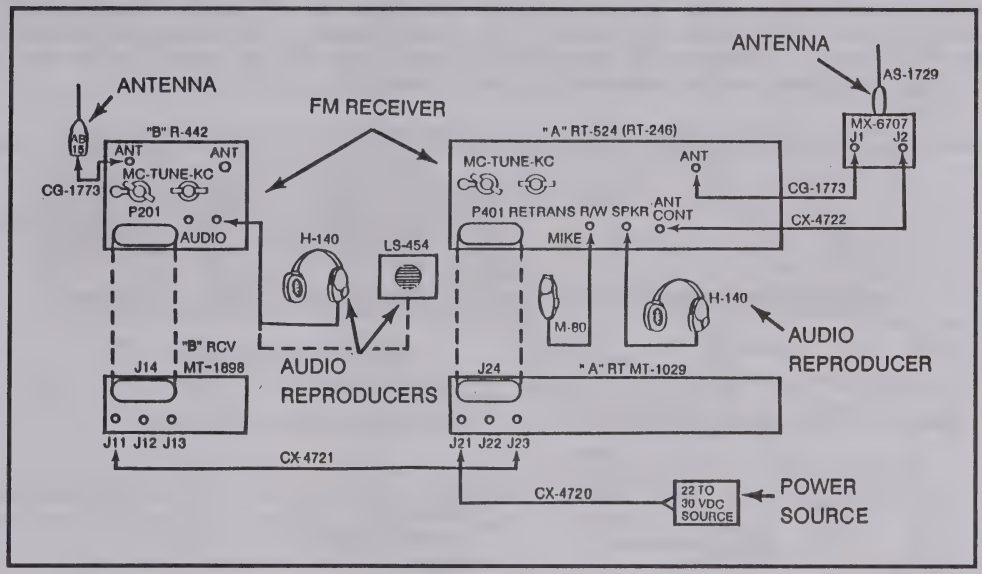


Figure 70. AN/VRC-47 radio set containing all of the basic components required for FM reception.

NOTE: The receive signal path in the RT-524 is identical to the receive signal path in the RT-246 and the R-442. If you learn the operation of the receive signal path of one AN/VRC-12 series radio component, you have learned them all.

(2) Realize that the signal being received is a transmitted FM wave; that is, an RF signal that is changing in frequency according to a modulating intelligence such as your voice. (See Figure 71.)

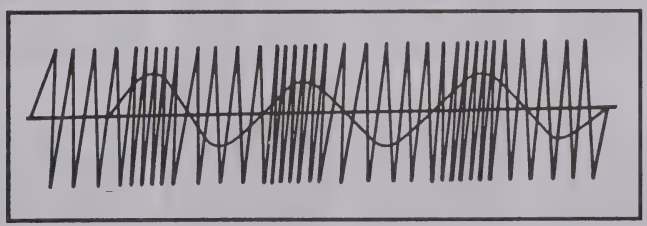


Figure 71. Modulated RF signal.

(3) This transmitted FM wave is intercepted by the receiver antenna and then applied to the receiver. The receiver, in turn, converts the frequency changes of the transmitted RF signal back to an intelligence signal such as a voice signal. This voice signal is then applied to an audio reproducer which converts the intelligence to sound. This intelligence also is applied through the MT-1029 mount from the RT plug P401 through jack J24 to jack J23, to be used with an additional radio component. (See Figure 72.)

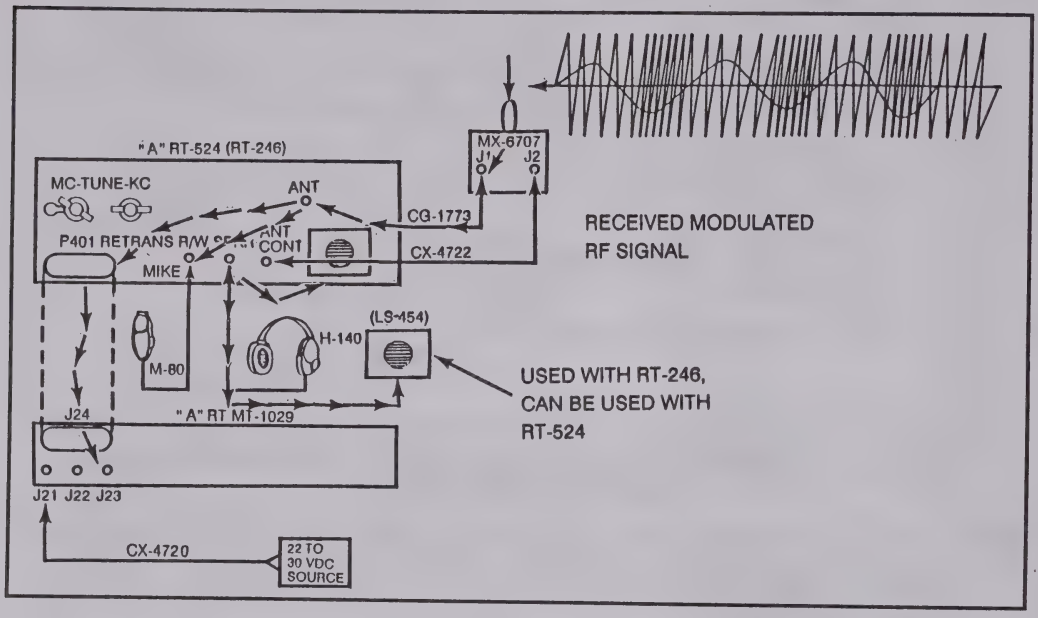


Figure 72. RT unit receive signal path.

(4) The most commonly used FM radios in the Army are the eight AN/VRC-12 series radios. These eight radio configurations consist of various combinations of three radio components: a receiver R-442 and a receiver-transmitter RT-524 or RT-246 and their mounts, cables, and accessories. (See Figure 73.)

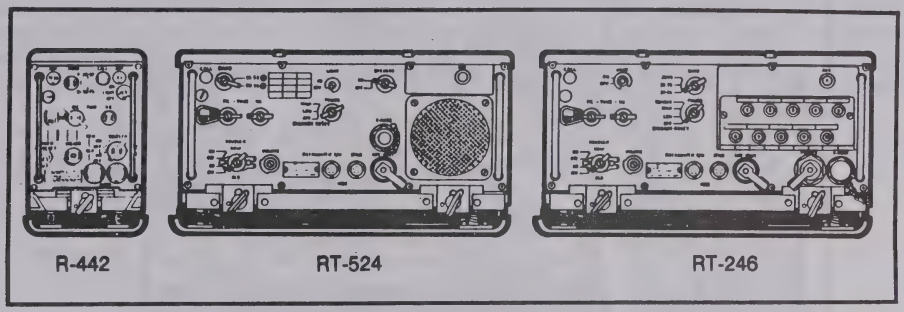


Figure 73. Radio components of AN/VRC-12 series radios.

(a) These radio set configurations consist of one or two receiver-transmitters or a receiver-transmitter and one or two auxiliary receivers. (See Figure 74.)

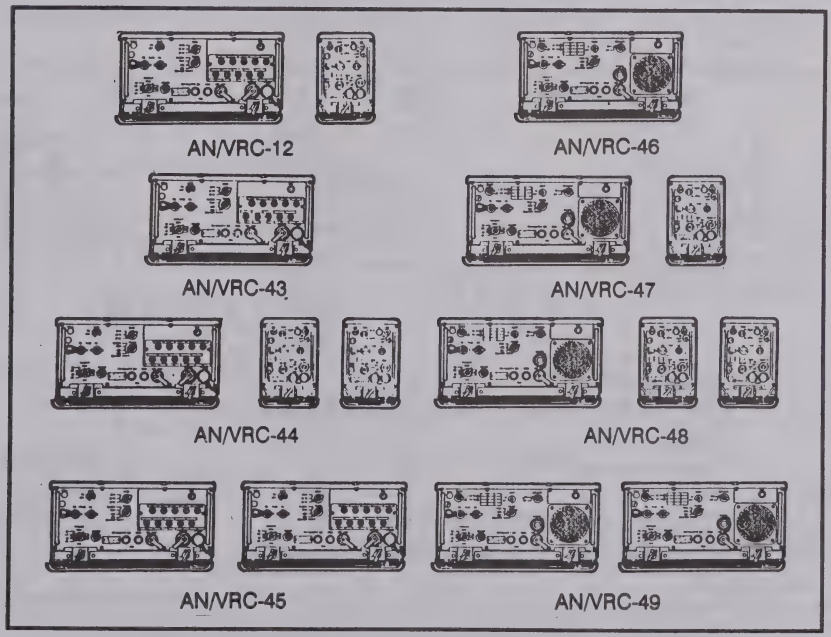


Figure 74. AN/VRC-12 series radio sets configurations.

(b) The most commonly used AN/VRC-12 series radio configuration is the AN/VRC-47. This radio set consists of one receiver R-442 and one receiver-transmitter RT-524. (See Figure 75.)

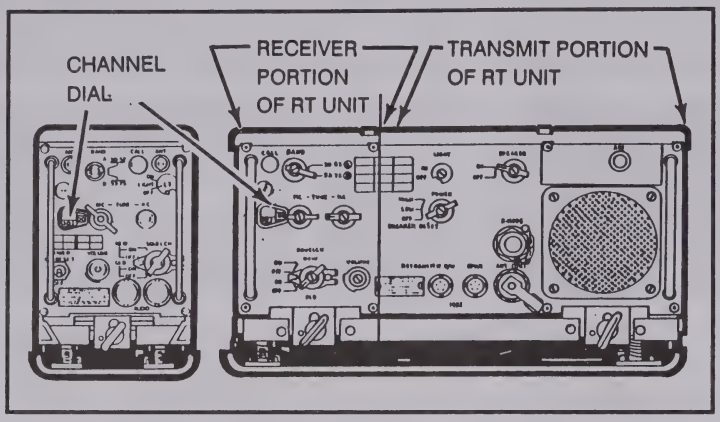


Figure 75. Radio set AN/VRC-47.

(c) See Figure 76. This is a typical cabling diagram for the AN/VRC-47. Note that the AN/VRC-47 has two receive signal paths--one for the receiver-transmitter and one for the auxiliary receiver, the R-442.

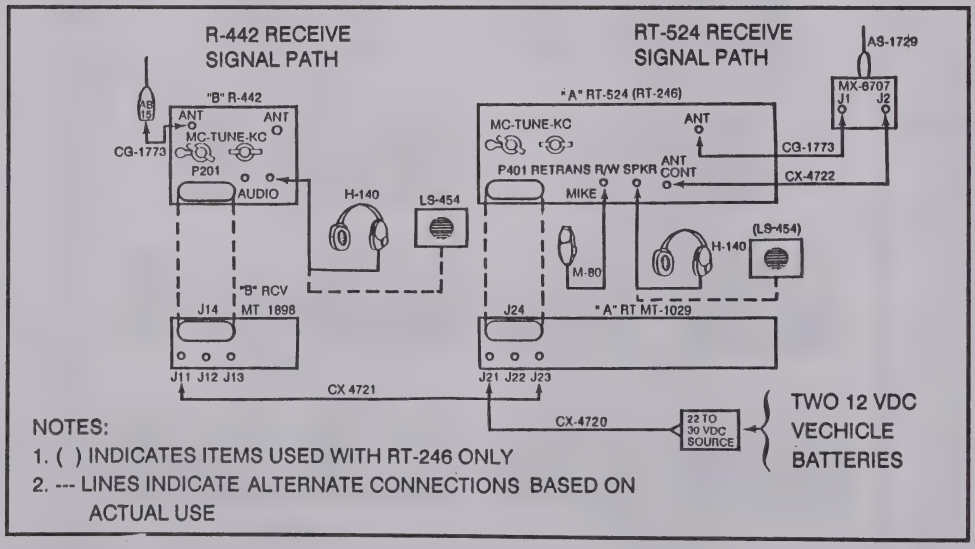


Figure 76. AN/VRC-47 two receiver signal paths.

(d) (See Figure 77.) Let us look at the receive signal path of the receiver-transmitter. The distant FM signal is intercepted by the elements of the antenna Ⓐ, and from there the FM signal is applied through the antenna matching unit MX-6707 to its output jack J1. From the matching unit, the FM signal is then sent through an RF cable CG-1773 to the RT antenna jack. The RT receiver section converts the frequency variations of the RF signal to audio signals and applies these audio signals to the RT MIKE jacks Ⓑ. The audio reproducer(s), such as the H-140 headset connected to one of the MIKE jacks, convert(s) the audio signals to sound Ⓒ. When the RT-524 speaker switch is turned on, an internal speaker also will convert these audio signals to sound.

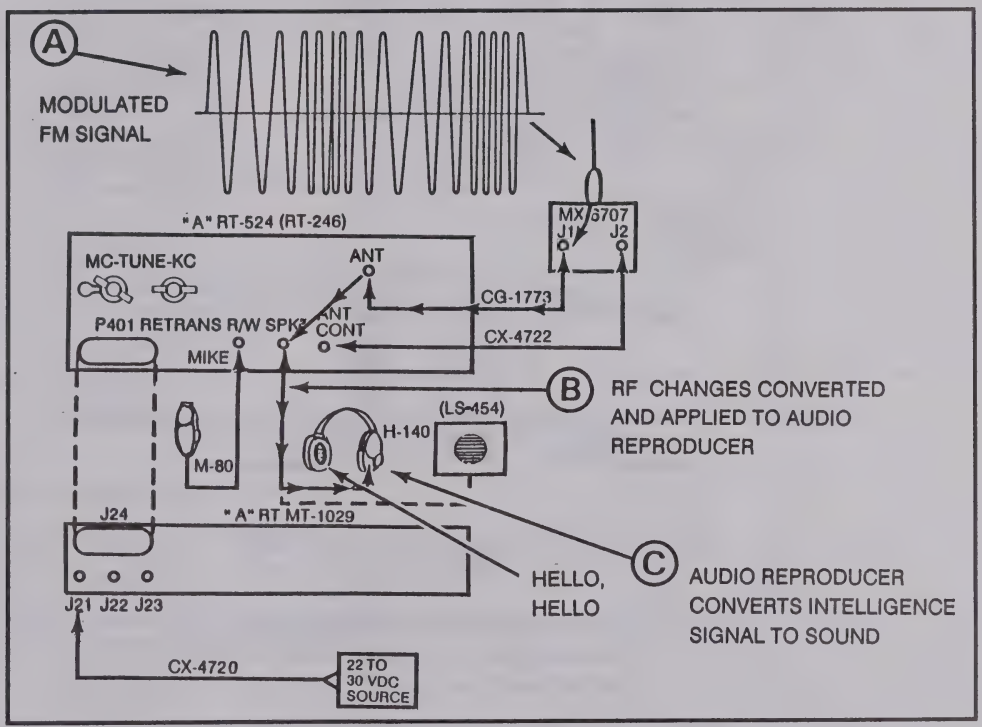


Figure 77. RT-524 receive signal path.

(e) For the receiver R-442, the distant transmitted signal is intercepted by the receiver antenna. From the antenna, the signal goes through the RF cable CG-1773 to one of the R-442 antenna jacks. This received FM signal is then processed through the R-442 receive signal path circuit in the same manner as for the RT-524 receive section. The resulting audio signal is applied to both of the R-442 audio output jacks. When an LS-454 loudspeaker or an H-140 headset is connected to one of the R-442 audio jacks, the audio signal will be heard. In addition, the speaker and phone outputs of a radio component, RT-524, RT-246, or R-442, can be extended through their respective mounts to an additional radio component. (See Figures 78 and 79.)

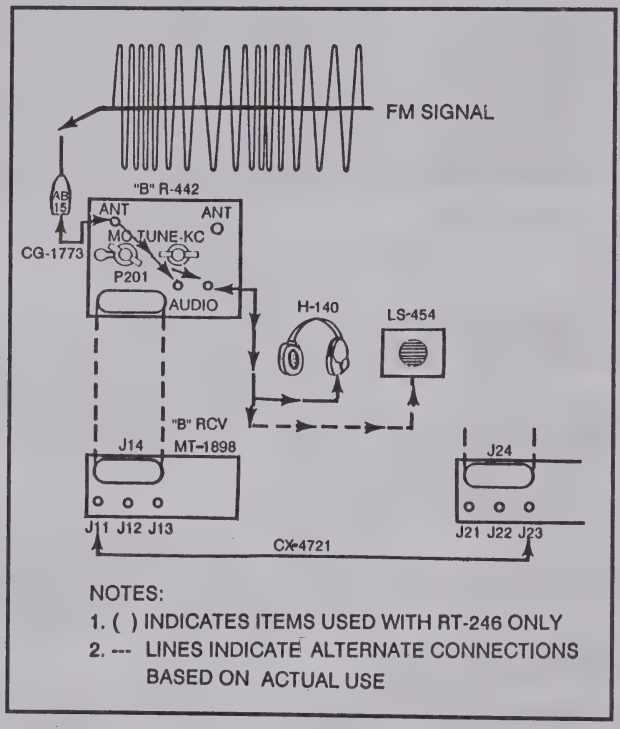


Figure 78. R-442 receive signal path.

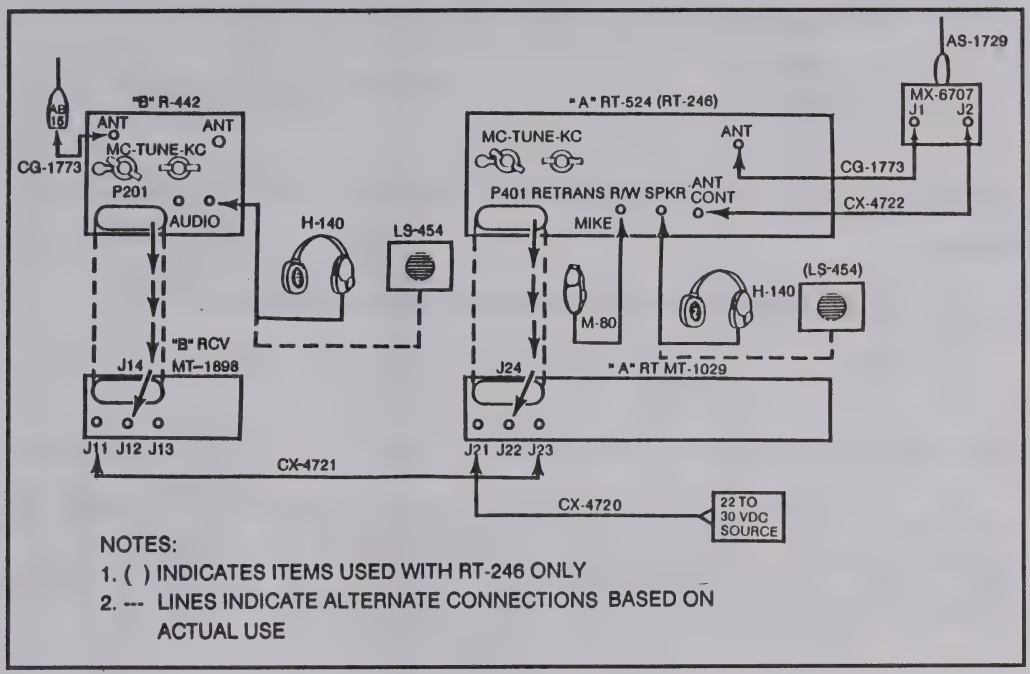


Figure 79. Radio audio output extended through their mounts for use in additional radios.

PRACTICE EXERCISES:

32. The basic components required for FM reception are _____ _____, _____ _____, _____, and _____ _____.

33. How many of the AN/VRC-12 series radio set configurations have a receive signal path?

    a. 2
    b. 4
    c. 8
    d. 10

34. The signal being received by an AN/VRC-12 series radio antenna is a transmitted _____ wave.

35. The most commonly used AN/VRC-12 series radio set configuration is--

    a. AN/VRC-12.
    b. AN/VRC-43.
    c. AN/VRC-46.
    d. AN/VRC-47.

36. How many receive signal paths does the AN/VRC-47 have?

a. two
b. four
c. five
d. six

//

ANSWERS:

32. power source, FM receiver, antenna, audio reproducer.
33. c.
34. FM
35. d.
36. a.

//

e. (See Figure 80.) This diagram shows you the assembly arrangement for the receiver R-442. Notice assemblies A1000 through A5000. Along with the R-442 antenna and audio accessories, these assemblies make up the R-442 receive signal path circuit. For the receive assemblies to operate, they must have an operating voltage of +16 VDC applied to them. The operating voltage is supplied by A2100.

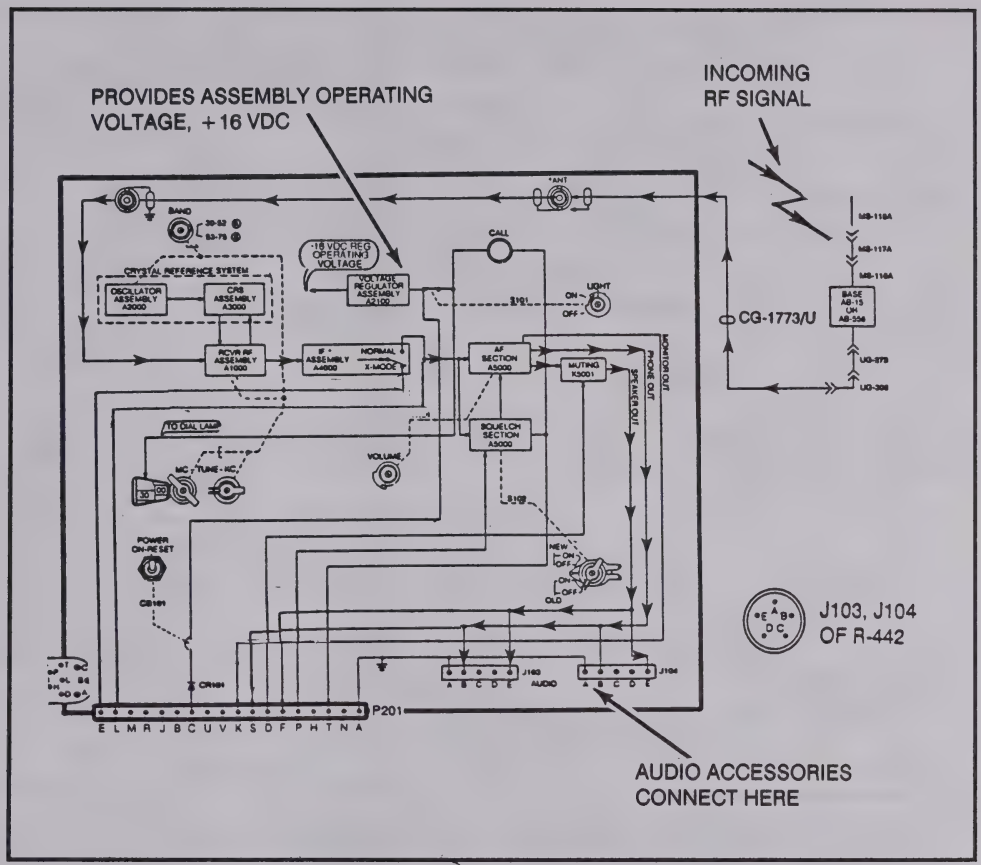

PROVIDES ASSEMBLY OPERATING VOLTAGE, +16 VDC
INCOMING RF SIGNAL
CG-1773/U
J103, J104 OF R-442
AUDIO ACCESSORIES CONNECT HERE
P201
E L M R J B C U V K S D F P H T N A

Figure 80. Receiver R-442 receive path assemblies A1000 thru A5000 and voltage regulator assembly A2100.

(1) Let us take a closer look at the voltage regulator assembly A2100. (See Figure 81.) The source voltage (vehicle batteries) is applied through the receiver mount (MT-1898) to Pin A (negative) and Pin C (positive) of plug P201. When the receiver POWER ON-RESET switch is ON, source voltage is applied to A2100 as shown Ⓐ. The voltage regulator assembly A2100 reduces its 22- to 30-volt input down to a positive 16 volts operating voltage and directly applies the +16 volts to assemblies A1000, A2000, A3000, and A4000 Ⓑ.

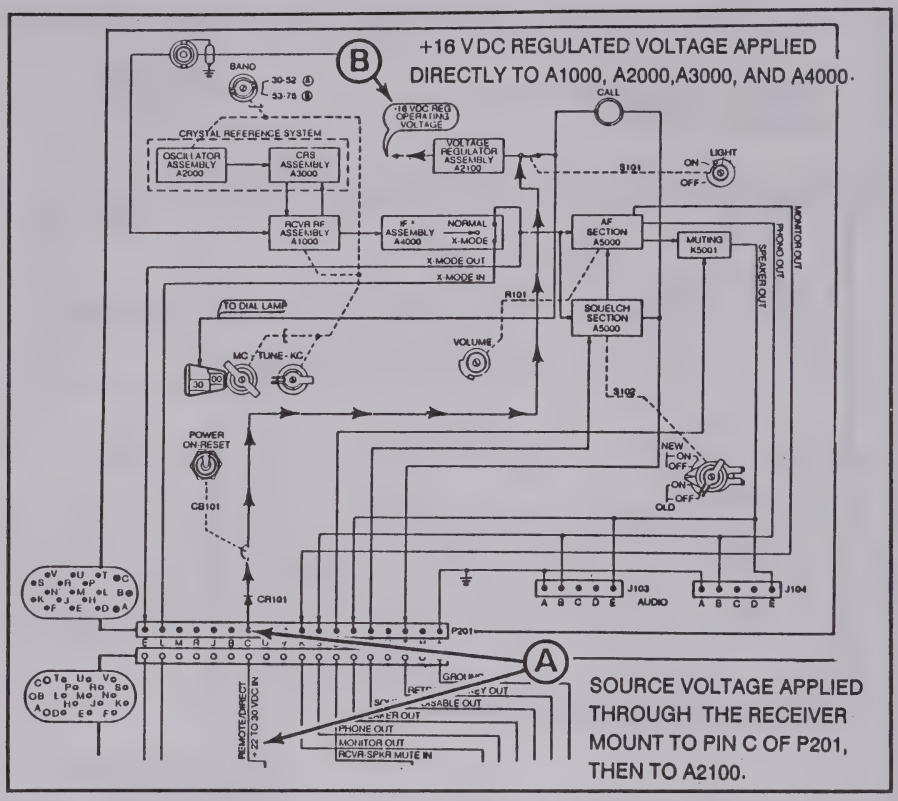


Figure 81. Function of voltage regulator A2100.

(2) Notice that the A5000 assembly has two parts--an AF section and a squelch section. (See Figure 82.) When the SQUELCH switch is in either of its OFF positions, the +16 volts from the A2100 is applied directly through the squelch assembly to the AF section. When the SQUELCH switch is in either of its ON positions, the squelch section controls the application of the operating voltage to the AF portion.

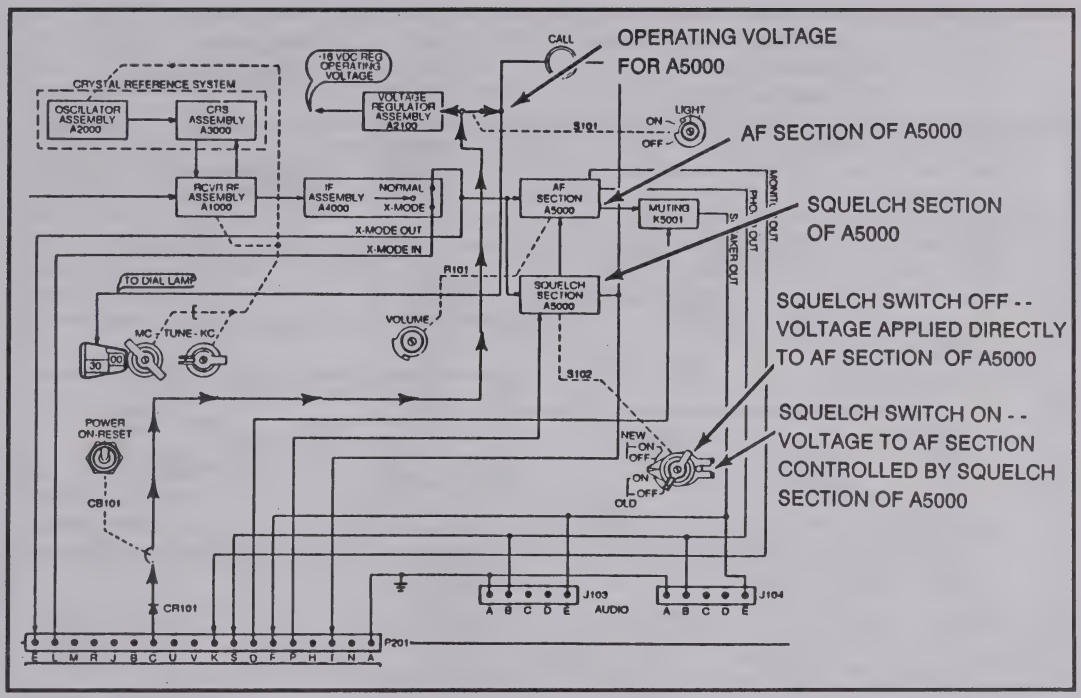


Figure 82. Operation of squelch assembly A5000.

(3) (See Figure 83.) This diagram shows how the RT-524 assemblies are interconnected. Remember that along with the assemblies shown, the A1000 through A5000, the RT antenna and its audio accessories make up the receive signal path circuit of the RT in the same manner as described for the R-442. Voltage regulator assembly A2100 provides operating voltage +16 volts that is applied to the receive assemblies. As before, the manner in which operating voltage is applied to A5000 is determined by the position of the RT SQUELCH switch. The remaining assemblies, A6000, A8000, and A9000, are used for transmission and will be discussed in a later learning event. (Study Figure 83 before going on with the text.)

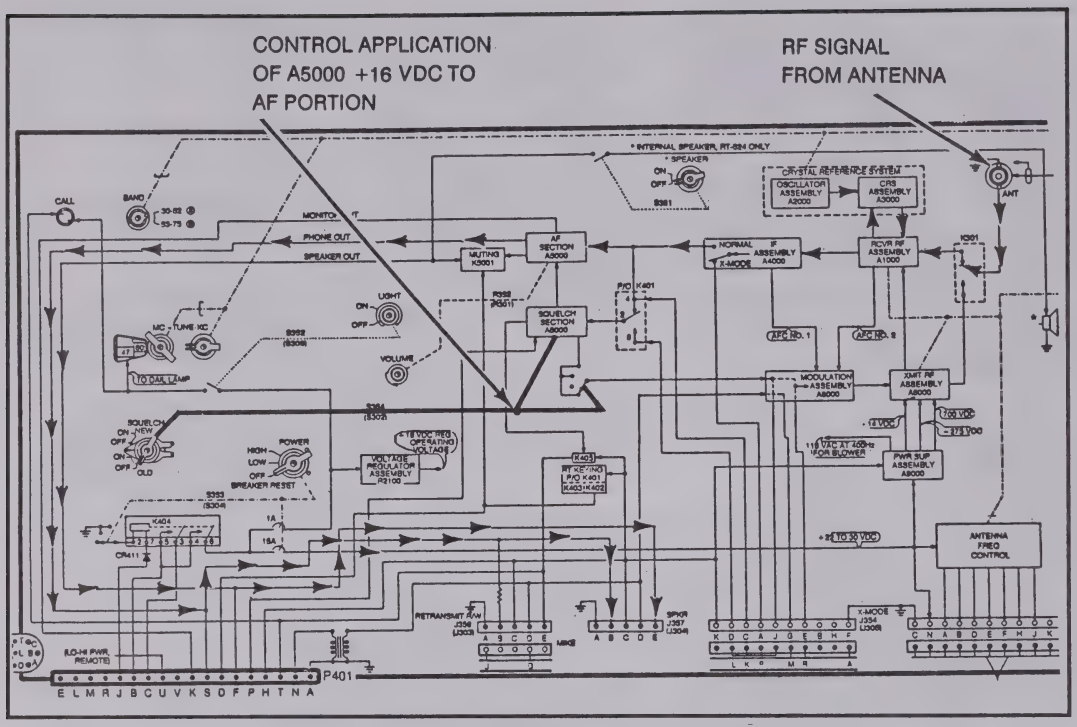


Figure 83. RT-524 assembly connections.

(4) Remember, the receive signal path assemblies of the receiver R-442 and those of the receiver-transmitter RT-524 are identical and are interchangeable. Their operation is the same, whether they are in the R-442 or the RT unit. In fact, if the left side of an RT was cut away, it would be another R-442. (See Figure 84.)

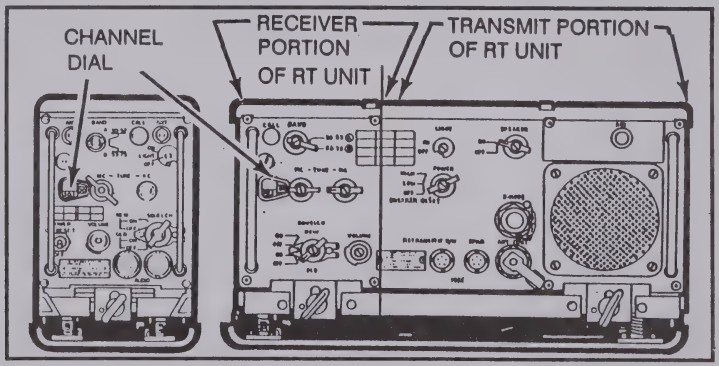


Figure 84. Location of receive signal path assemblies in an RT-524.

15. RECEIVE SIGNAL PATH CIRCUIT IN THE R-442 OR RT-524. Let us see how the receive signal path circuit in the AN/VRC-12 series radio components, R-442 or RT-524, takes the frequency variations of an FM signal at its antenna and converts it to audio signals at its output. Let us establish a receive situation: First, to receive a signal, you must turn the radio on so operating voltage is applied to the receive assemblies. Second, let us operate the radio without squelch so the radio SQUELCH switch is in one of its OFF positions, NEW OFF or OLD OFF. Remember, as discussed earlier, placing the SQUELCH switch in an OFF position applies operating voltage directly from A2100 to the AF portion of A5000. Third, the radio must be turned to the channel frequency you want to receive. The AN/VRC-12 series radio components will receive on any one of 920 channels, as determined by the settings of the tuning controls--the BAND switch, the megahertz control, and the kilohertz control. (See Figure 85.)

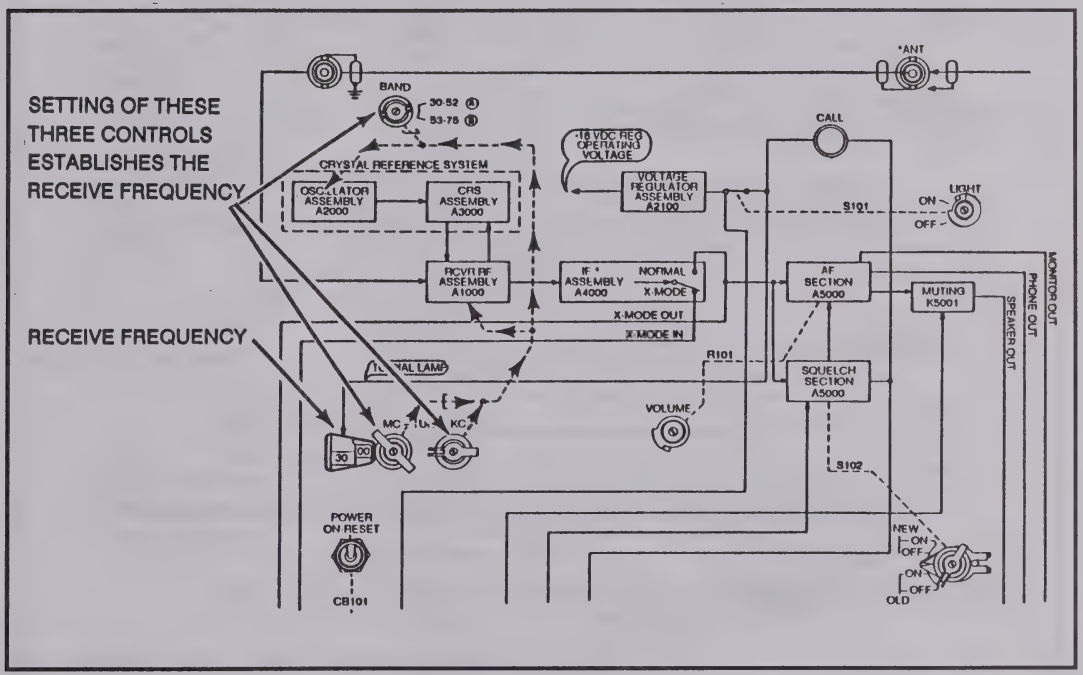


Figure 85. R-442 radio tuned to a specific channel of operation.

a. In the R-442, the FM signal (Figure 86 Ⓐ) being received by the radio antenna is sent to assembly A1000 where it is amplified and compared by the A2000 and A3000 assemblies and then sent to the A4000 assembly. The signal is amplified and sent through an X-MODE switch. The X-MODE switch must be in its NORMAL position when speech security equipment is not used, but this switch must be in its X-MODE position if speech equipment is being used. The signal is then sent to the AF portion of the A5000 assembly where it is greatly amplified Ⓑ and sent to the audio jack so it can be heard in the audio reproducers Ⓒ. The VOLUME control Ⓓ controls the audio signal amplification and audio level.

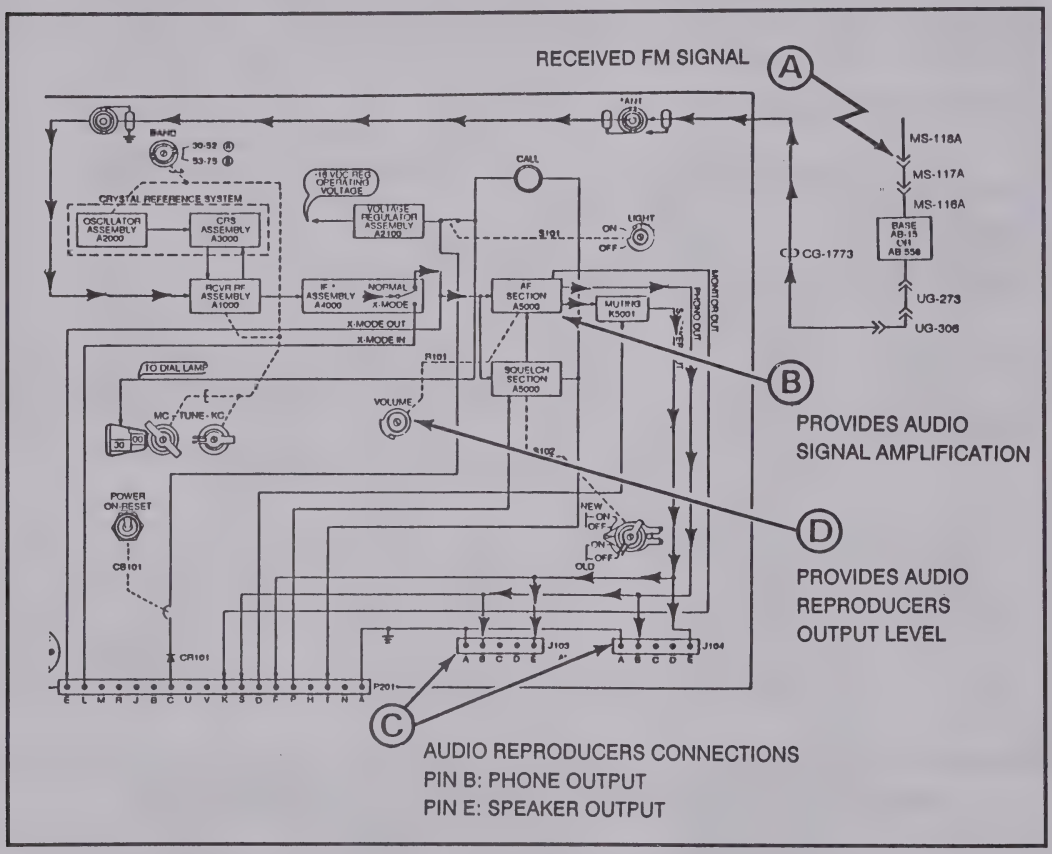


Figure 86. Received FM signal processed from antenna to audio reproducers, X-MODE SWITCH IN NORMAL.

b. The audio outputs of the R-442 and the RT units can be extended through their respective mounts for use with auxiliary equipment. (See Figure 87.)

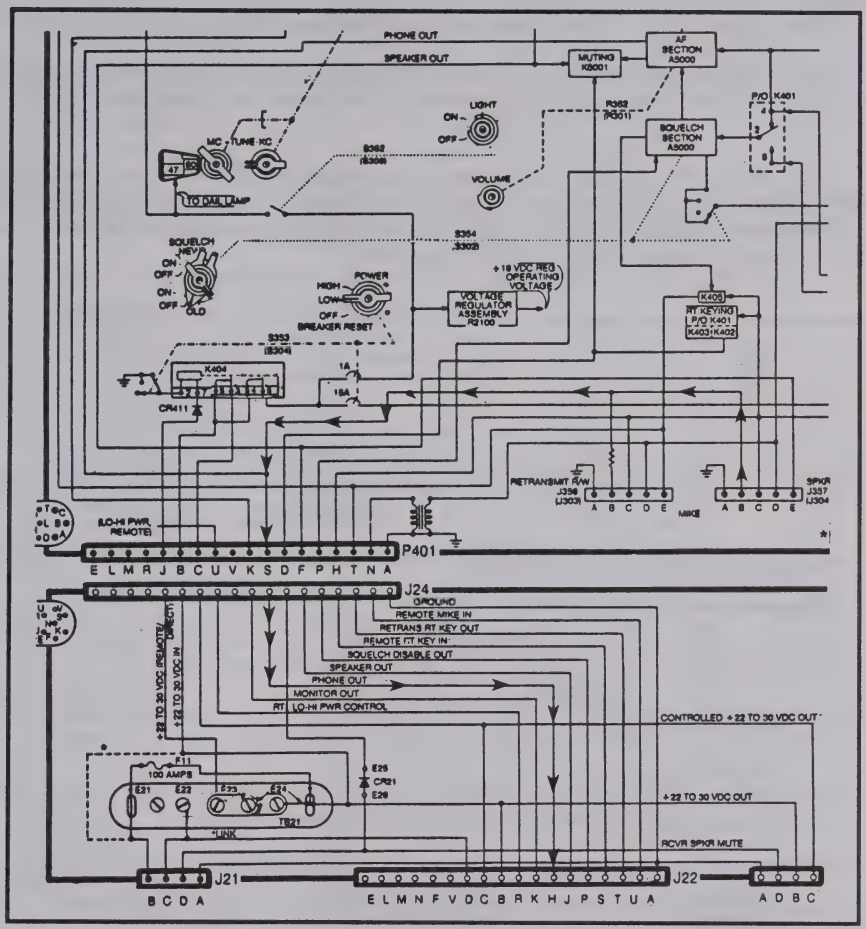


Figure 87. RT audio output extended through its mount MT-1029 for use with auxiliary equipment.

The extended audio output of the RT unit is:

(1) The phone circuit is from Pin B of the RT speaker jack to Pin S of plug P401, through the mount MT-1029 to Pin H of jack J22.

(2) The speaker circuit is from Pin E of the RT speaker jack to Pin F of plug P401, through the mount MT-1029 to Pin J of jack J22. (Study Figure 88 before proceeding.)

c. (See Figure 88.) There are two extended audio outputs for the R-442.

(1) The phone circuit is extended from Pin B of the R-442 audio jacks, J103 and J104, to pin S of plug P201, through the mount MT-1898, to Pin H of jack J12.

(2) The R-442 speaker circuit is extended from Pin E of the audio jacks J103 and/or J104, to Pin F of plug P201, through the MT-1898, to Pin J of jack J12. Remember, these audio circuits are extended for use with additional components. (Study Figure 88 before proceeding.)

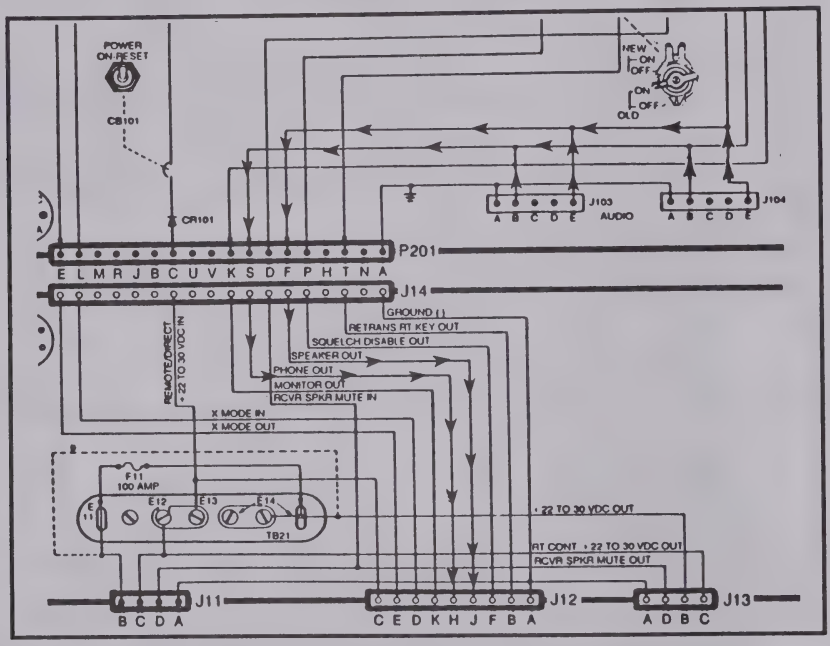


Figure 88. R-442 audio output extended through its mount MT-1898 for use with auxiliary equipment.

PRACTICE EXERCISES:

37. Which assembly in the R-442 provides the operating voltage for assemblies A1000 through A5000?

a. A1000
b. A2000
c. A2100
d. A5000

38. Which pin of the radio plug P201 applies voltage to the voltage regulator assembly A2100?

    a. Pin B
    b. Pin C
    c. Pin S
    d. Pin M

39. The SQUELCH switch must be in one of its _____ positions for voltage to be applied directly to the AF portion of the A5000 assembly.

40. The voltage regulator assembly A2100 converts the 22 to 30 VDC input voltage to--

    a. +12 VDC.
    b. +14 VDC.
    c. +16 VDC.
    d. +19 VDC.

41. The receive signal path assemblies of the R-442 and the RT-524 are _____ and _____.

42. The receive signal path circuits in the AN/VRC-12 series radios convert FM signals to _____ _____ at its output.

43. To tune the radio to the desired operating frequency, the _____ _____ and the _____- _____- _____ controls must be used.

44. When operating the R-442 without speech security equipment, the X-MODE switch must be in the _____ position.

45. The radio audio signals are extended through their respective _____ for use with auxiliary equipment.

46. (See Figure 87.) The extended audio phone circuit in the MT-1898 mount is from Pin _____ of P201 to Pin _____ of J12.

//

ANSWERS:

37. c.
38. b.
39. OFF
40. c.
41. identical, interchangeable.
42. audio signals
43. BAND switch, MC-TUNE-KC
44. NORMAL
45. mounts
46. S, H

//

d. When the radio is turned on (Figure 89 Ⓐ), the SQUELCH switch is in one of its OFF positions, and there is no incoming signal Ⓑ, there will be a rushing noise in the audio reproducer(s). This rushing noise is a result of operating voltage being applied to assemblies A1000 through A5000 Ⓒ. If assemblies A1000 through A5000 are working correctly and the radio VOLUME control is set at mid-scale, this rushing noise will be very, very loud. In fact, if the rushing noise is being listened to in an H-140 headset, the rushing noise could be heard while the headset is lying on the work bench. However, if some of the assemblies, A1000 through A5000, are working and some are not working, the rushing noise will be weak (not as loud). If the radio operator had to listen to this rushing noise all the time that a signal was not being received, it would drive him bananas.

e. So that the operator does not have to listen to a rushing noise when a signal is not being received, the radio receiver has a squelch function that automatically turns the rushing noise off and then automatically turns the sound on when a signal is present at the antenna. With the SQUELCH switch set in one of its ON positions, NEW ON Ⓓ, the voltage path to the AF section of A5000 is broken open; therefore, no sound is produced Ⓔ.

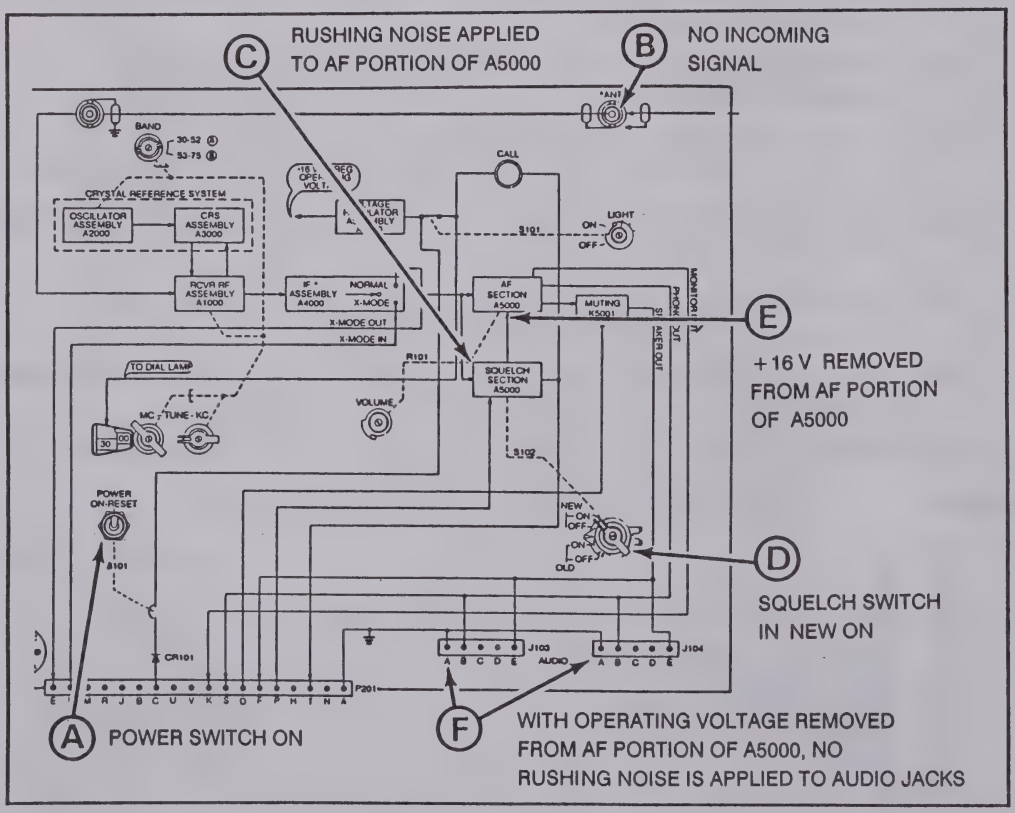


Figure 89. Receiver NEW ON squelch operation with no signal being received.

f. To reapply operating voltage to the AF portion of A5000 and in turn produce sound at the audio reproducers, the squelch portion must be turned on by an incoming received RF signal. Let us see how the received signal automatically turns on A5000. First and most critical, the distant transmitter RF signal must be modulated with a constant 150-Hertz (Hz) tone. At the distant transmitter, this 150-Hz tone is in addition to any modulation of the RF that is caused by the operator's voice. (See Figure 90.) These signals are received

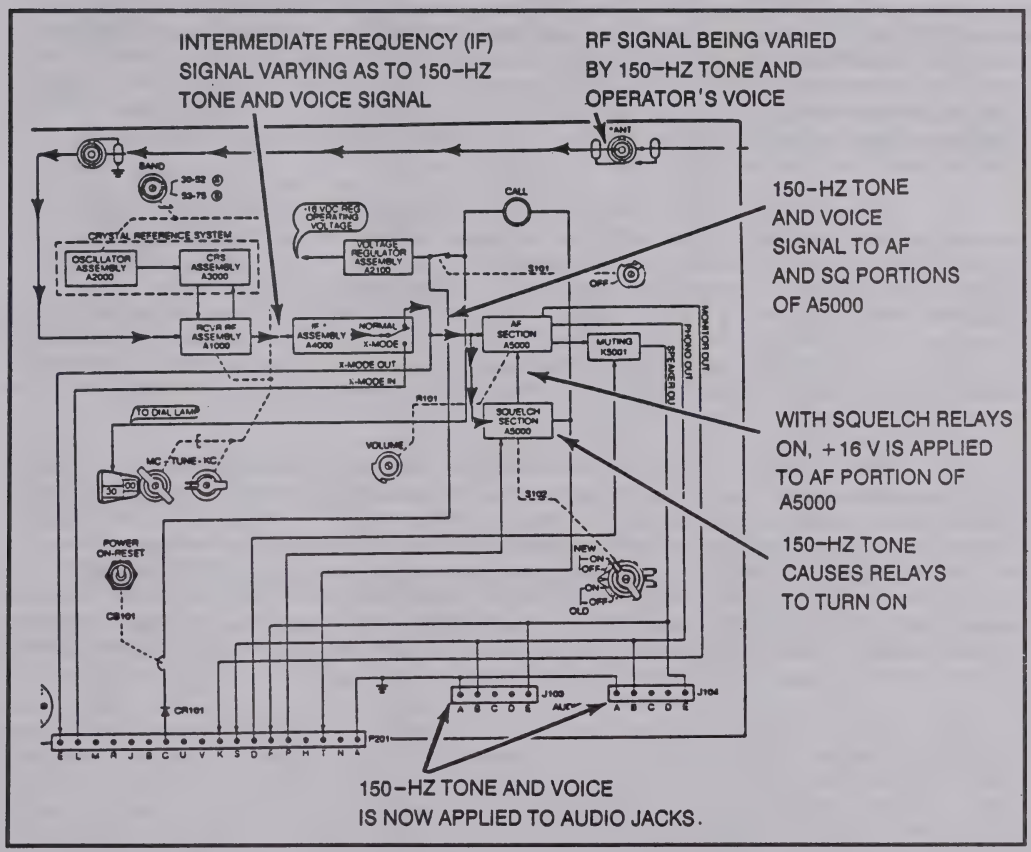


Figure 90. R-442 squelch operation with 150-Hz and voice input.

at the radio antenna, then sent through the receive assemblies to the A4000 output, and then they are applied to both portions of the A5000 assembly. The squelch portion will filter out the voice signal and use the 150-Hz tone to turn it on. As long as the 150-Hz tone is present, the squelch portion will remain on and operating voltage will be applied to the AF portion. As long as operating voltage is applied to the AF portion, the voice signal at its input will pass through it and be reproduced by the audio accessories. When the operator at the distant transmitting station is not speaking, but he has his transmitter keyed and modulated by a 150-Hz tone, the 150-Hz tone will be faintly heard at the output of your receiver. When the transmitter operator speaks, you will note that the receiver voice output signal is much louder than the 150-Hz tone. An additional indicator will be observed when operating the radio in SQUELCH NEW ON; that is, with the LIGHT switch on and a signal containing a 150-Hz tone received, the radio CALL lamp lights; and remains lit as long as the distant station operator is transmitting.

g. To summarize, when a receiver is squelched and there is no signal present at its antenna, there will be no sound heard at the receiver audio reproducers. When a receiver is squelched by placing its SQUELCH switch in NEW ON, the distant transmitter must send to the receiver an RF signal that is frequency modulated by a 150-Hz tone. This 150-Hz tone is often referred to as a tone-operated squelch. Some FM transmitters do not have provisions for sending the 150-Hz squelch tone required to operate an AN/VRC-12 series radio receiver NEW ON squelch mode. When this is the case, the AN/VRC-12 series radios must be operated in the OLD ON squelch mode.

h. Let us take a look at how a receiver with the POWER switch on (Figure 91 Ⓐ) operates when its SQUELCH switch is in OLD ON Ⓑ. When a signal is not present at a receiver antenna Ⓒ, a loud rushing noise is present at the output of the A4000 assembly Ⓓ; and this rushing noise is applied to the squelch section of A5000 assembly. When the operator moves the radio SQUELCH switch to its OLD ON position, the squelch section of A5000 will use the receiver internal rushing noise to hold the squelch off and remove the operating voltage from the AF section Ⓔ. A rushing noise is not heard at the receiver audio reproducers Ⓕ.

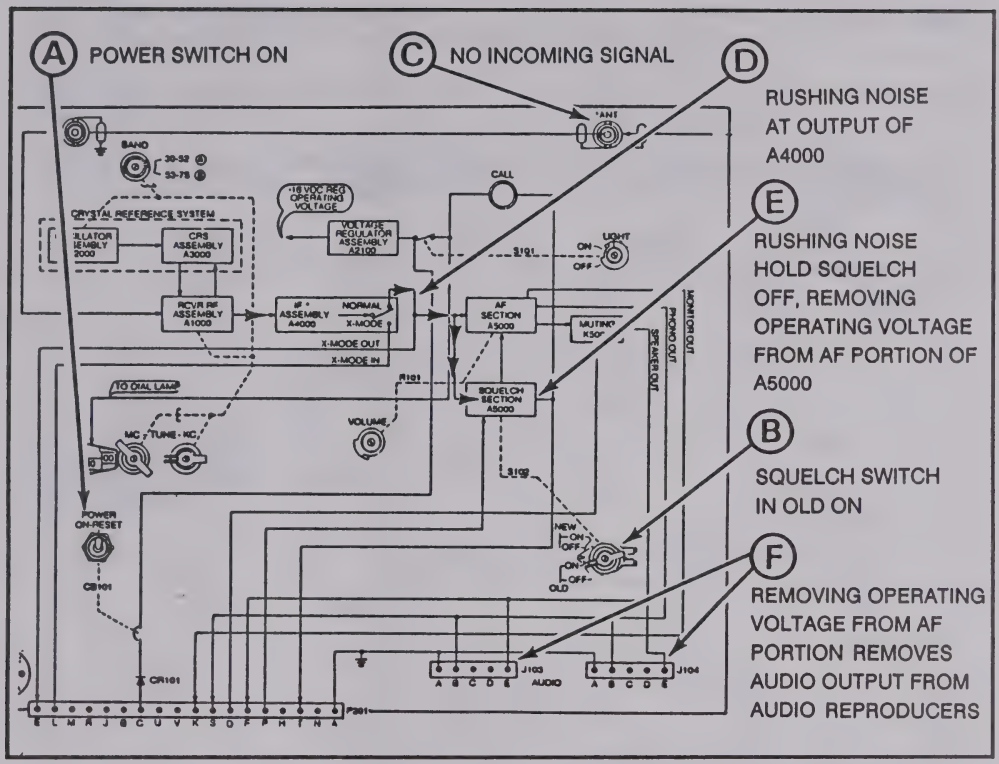


Figure 91. Receiver OLD ON squelch operation with no signal received.

i. When an RF signal is received at the antenna (Figure 92 Ⓐ), modulated or not, the rushing noise at the output of assembly A4000 Ⓑ will be eliminated with no rushing noise applied to the squelch section of A5000. The squelch section will come on Ⓒ, the CALL lamp will light Ⓒ, and operating voltage will be reapplied to the AF section of A5000 Ⓓ. Because it is the receiver internal rushing noise that operates the squelch when the SQUELCH switch is in OLD ON, this mode (OLD ON) is said to be noise operated. A final important point about the two squelch modes that you must keep in mind is the action of the CALL lamp. For NEW ON, the CALL lamp will light only when the receive signal contains a continuous 150-Hz tone. For OLD ON, the CALL lamp will light whenever the receiver rushing noise is of a low level or eliminated, as when a signal is being received from a distant station. When no signal is being received, the rushing noise will be normal, and it will keep the CALL lamp turned off.

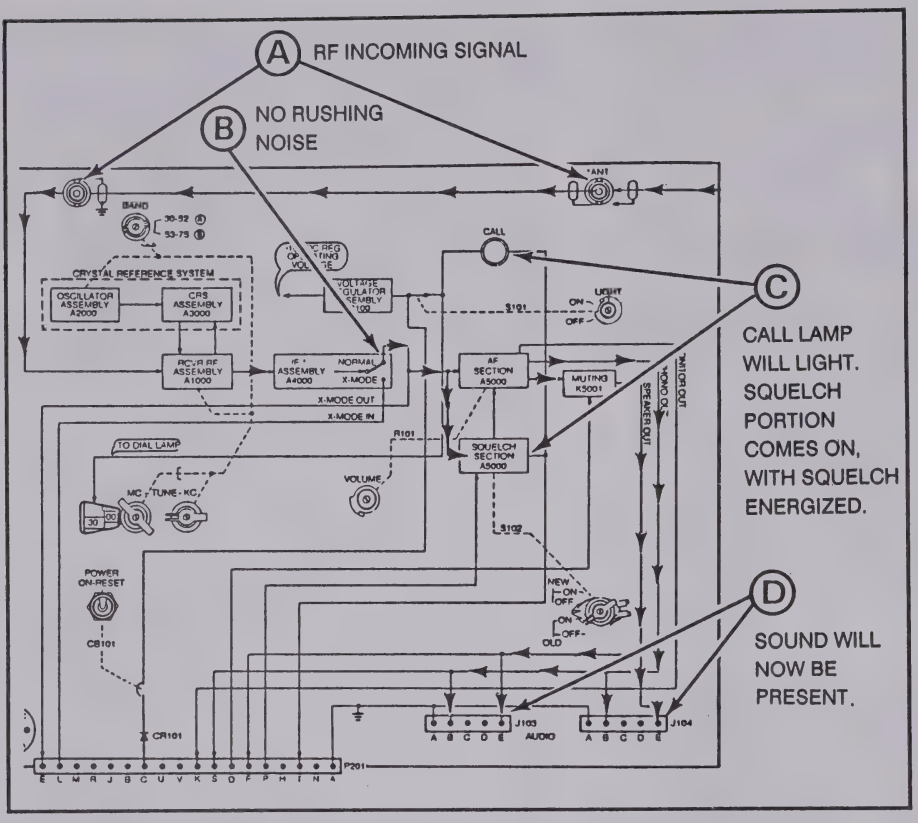


Figure 92. Receiver OLD ON operation with RF signal received.

PRACTICE EXERCISES:

47. A rushing noise in the audio reproducer(s) is produced by which assemblies?

    a. A1000 through A5000
    b. the incoming signal
    c. the radio dial frequency
    d. none of the above

48. When the SQUELCH switch is set to _____ _____, operating voltage is removed from the AF section of A5000 and no rushing noise is heard in the radio audio reproducers.

49. To reapply operating voltage to the AF section of A5000, when the SQUELCH switch is set in NEW ON, the incoming signal must be modulated with a constant _____ _____.

50. With the SQUELCH switch in the NEW ON position, the radio CALL lamp will light only as long as the distant station's operator is _____.

51. When the radio SQUELCH switch is in its NEW ON position, this squelch mode is called _____ _____ _____.

52. If a distant transmitter does not have a 150-Hz tone transmitting capability, the AN/VRC-12 series radios must be operated in squelch _____ _____.

//

ANSWERS:

47. a.
48. NEW ON
49. 150-Hz tone.
50. transmitting.
51. tone operated squelch.
52. OLD ON.

//

j. (See Figure 93.) When COMSEC (VINSON) equipment is used with the radio system RT unit, the receive signal path (plaintext) is as follows: The received signal is intercepted by the RT antenna elements, sent through the MX-6707, through the RF cable CG-1773 and applied to the RT unit antenna jack. The signal is then sent through relay K301, through RCVR RF assembly A1000, through IF assembly A4000, and through the X-MODE switch and applied to pin A of the RT X-MODE jack. The signal then sent through the CX-13064/U cable from Pin A of plug P3 to Pin P of plug P1. The signal is then applied to Pin P of jack J6 on the J-3513/U junction box, through relay K8B and back to Pin K of jack J6. The signal is then sent back through the CX-13064/U cable from Pin K of plug P1 to Pin C of plug P3 and is applied to Pin C of the RT X-MODE jack. The signal then travels from Pin C of the X-MODE jack through relay K401 and is applied to the squelch section and AF section of assembly A5000. The output of the AF section of A5000, the audio unmuted circuit is sent through the RT to Pin S of plug P401. At the same time, a sample of the audio output of the AF section of A5000 is tapped off and sent to Pin B of the RT RETRANS jack. The audio signal at Pin S of P401 is sent through the MT-1029 mount from Pin S of jack J24 to Pin H of jack J22. The signal is then applied to Pin H of the J-3513/U junction box plug P1 through the J-3513/U to Pin B of the J-3513/Us jack J5. From this point, it is applied to the handset phone out circuit. At the same time, a tap on this circuit is sent to Pin B of J-3513/U jack J3, where it is sent through the CX-13061/U cable from Pin B of P1 to Pin C of P2. The signal is then sent through the KY-57 from Pin C of the radio jack, through relay K3A to Pin B of the KY-57 audio jack. From this point, the signal is sent through the CX-13062/U cable from Pin B of plug P2 to Pin B of plug P1. The signal is then sent through the J-3513/U from Pin B of J1, through a resistor to Contact 1 of relay K8B.

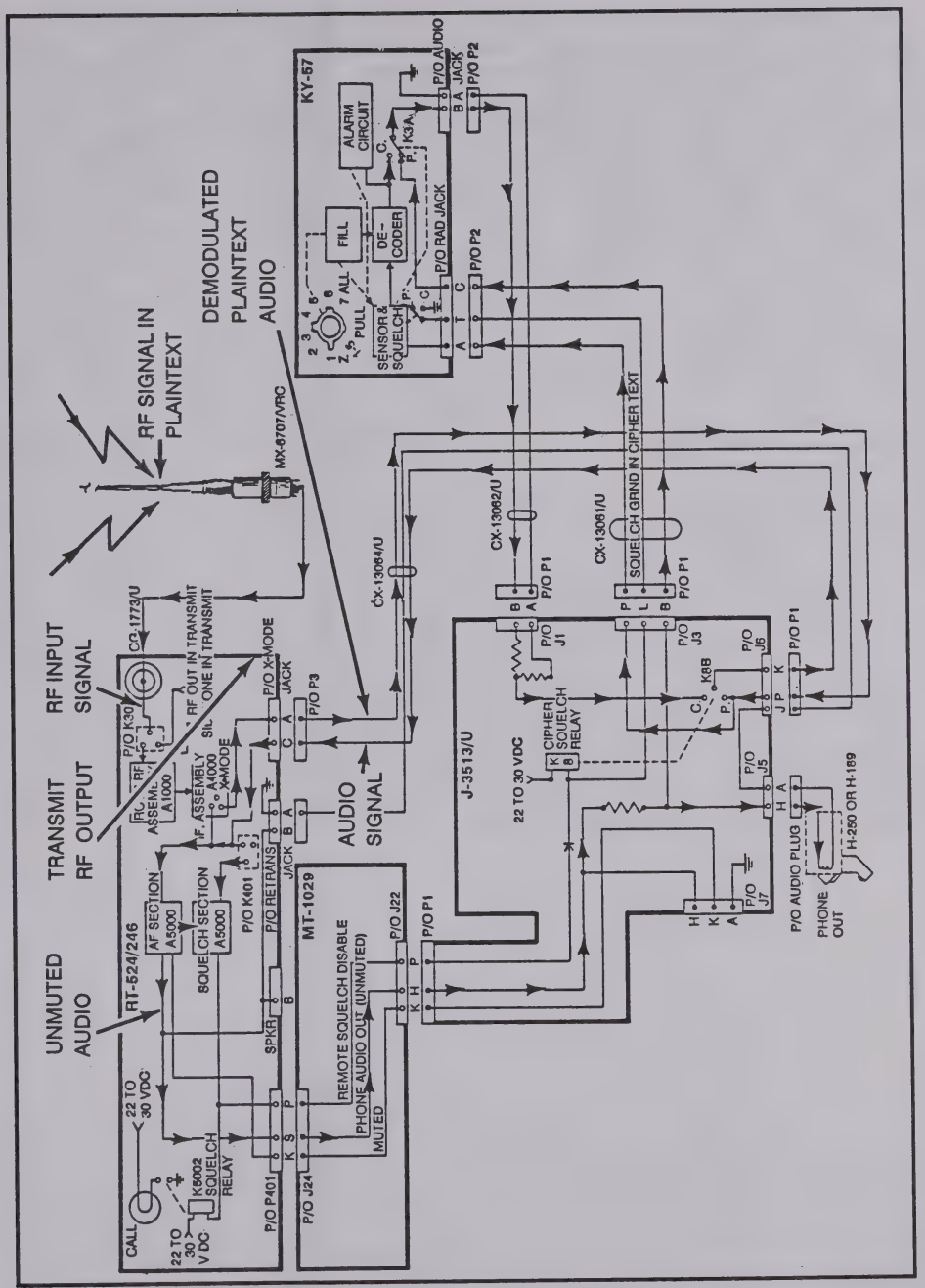


Figure 93. VINSON secured RT-524/VRC (RT-246/VRC) receive, plaintext audio circuits.

k. (See Figure 94.) When COMSEC (VINSON) equipment is used with the radio system RT unit, the receive signal path (cipher text) is as follows: The received signal is intercepted by the RT antenna elements, sent through the MX-6707 through the RF cable CG-1773/U and applied to the RT unit antenna jack. The signal is then sent through relay K301, through RCVR RF assembly A1000, through IF assembly A4000, and through the X-MODE switch and is applied to Pin A of the RT X-MODE jack. The signal is then sent through the CX-13064/U cable from Pin A of plug P3 to Pin P of plug P1. The signal is then sent through Pin P of jack J6 on the J-3513/U junction box to Contact 3 of relay K8B. The receive circuit up to this point is the same as was explained for the plaintext receive circuit. Now, the cipher text signal is taken from the circuit tie point just below Contact 3 of relay K8B and sent to Pin P of the J-3513/U jack J3. From Pin P of J3, the signal is sent through the CX-13061/U cable from Pin P of plug P1 to Pin A of plug P2 where it is applied to Pin A of the radio jack (RAD jack) on the KY-57. The ciphered signal is applied from Pin A of the KY-57 RAD jack to the SENSOR and SQUELCH section of the KY-57. When the signal is sensed as being a ciphered signal (a beep will be heard in the handset), relay K3B movable contact will move to the C position (ground) and will apply a ground to the CIPHER SQUELCH relay K8 in the J-3513/U, then through the MT-1029 mount Pin P of J22 to Pin P of J24, and then into the RT unit where it applies a ground to the RT squelch relay K5002. The sensed cipher signal in the KY-57 also is sent to the KY-57 DECODER, where it is deciphered and sent through relay K3A (in the C position) and on to Pin B of the KY-57 AUDIO jack. The deciphered signal is sent through the CX-13062/U cable from Pin B of P2 to Pin B of P1, where it is applied to Pin B of jack J1 on the J-3513/U. The signal goes through the J-3513/U from Pin B of J1, through Contacts 1 and 2 of relay K8B, and to Pin K of jack J6. The signal is then sent through the CX-13064/U cable from Pin K of P1 to Pin C of plug P3, where it is applied to Pin C of the RT X-MODE jack. From Pin C of the X-MODE jack, the signal is sent through relay K401 to the RT squelch section and the AF section of assembly A5000. From the AF section of A5000, the signal is sent to Pin S of plug P401, on the back of the RT, where it is applied to Pin S of jack J24 on the MT-1029. From Pin S of J24, the signal goes to Pin H of J24, to Pin H of plug P1 of the J-3513/U, and through the J-3513/U to Pin B of the J-3513/U jack J5, where it is applied to the handset phone out circuit.

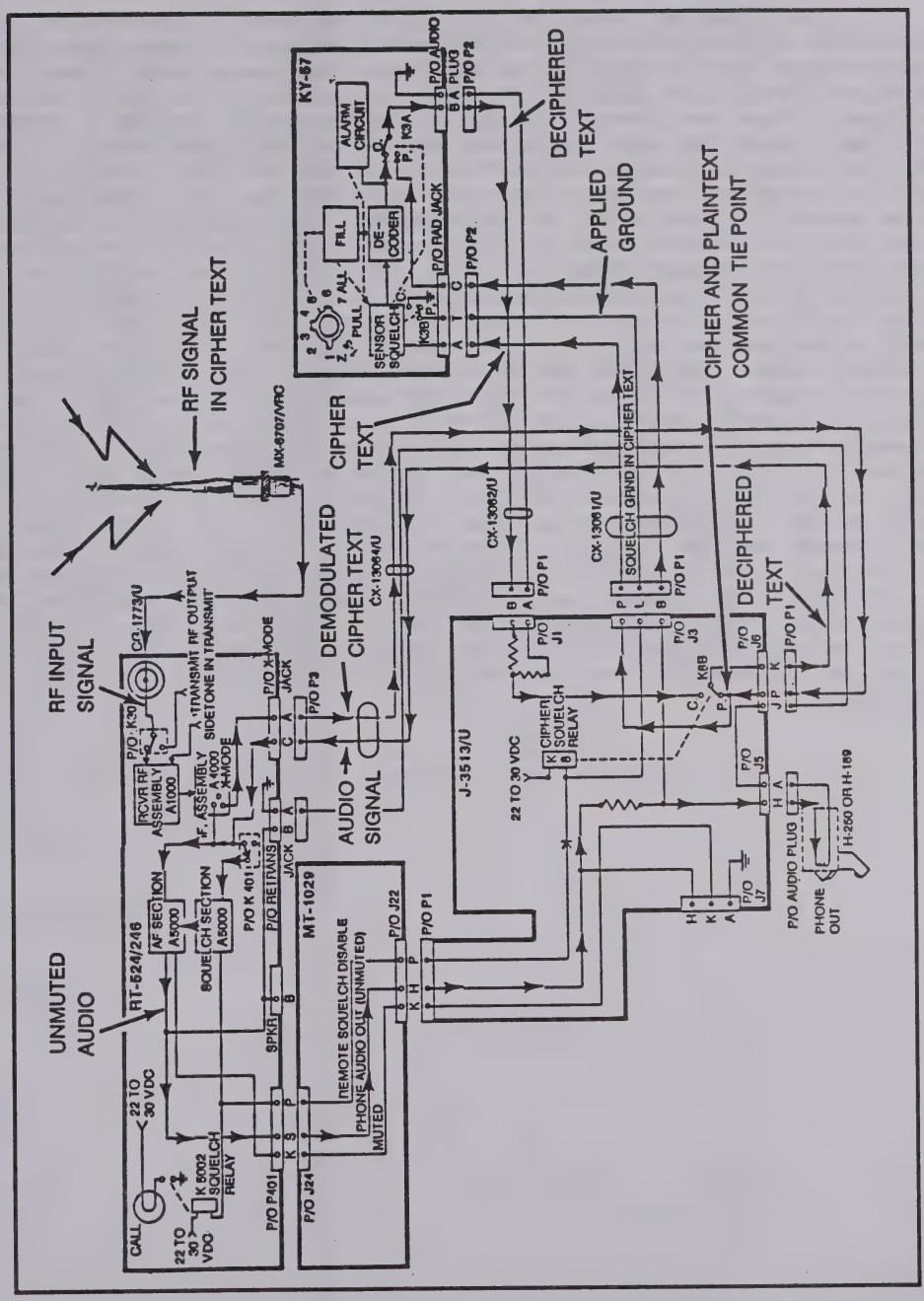
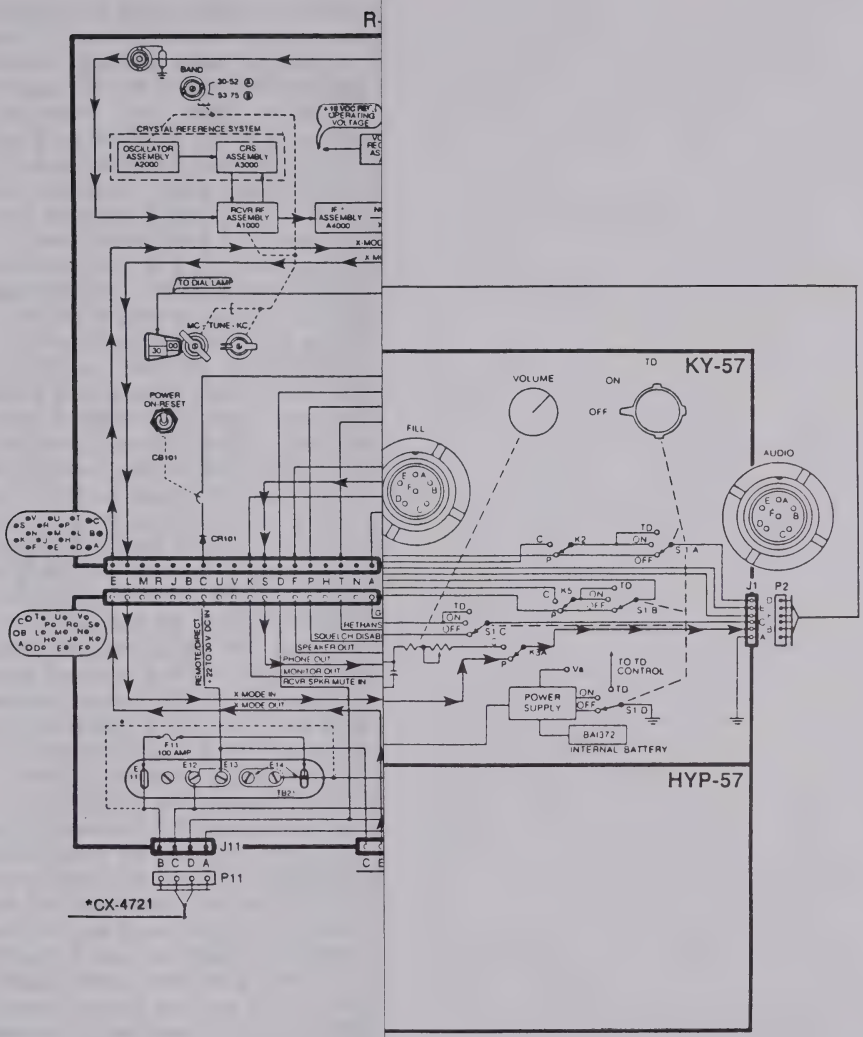


Figure 94. VINSON secured RT-524/VRC (RT-246/VRC) receive, cipher text audio circuits.

1. (See Figure 95.) When COMSEC (VINSON) equipment is used with the radio system R-442 receiver, the receive signal path (plaintext) is as follows: The received signal is intercepted by the R-442 antenna elements, sent through the AB-15 antenna base through the CG-1773/U RF cable, and applied to the R-442 antenna jack. The signal is then sent through the RCVR RF assembly A1000, through IF assembly A4000, and through the X-MODE switch and then is applied to Pin L of the R-442 plug P201. The signal is then applied to Pin L of the MT-1898 mount through the MT-1898 X-MODE IN circuit and applied to Pin D of the MT-1989 jack J12. Then the signal is applied to Pin D of plug P1 of the J-3514 cable. The signal is then sent through Contact 4 of the J-3514 circuit board to contact B3 of relay K2, through contact B2 of relay K2, back through Contact 2 of the J-3514 circuit board to Pin E of P1 of the J-3514 cable. The signal is then applied to Pin E of the MT-1898 jack J12, through the MT-1898S X-MODE OUT circuit to Pin E of the MT-1898 jack J14. The signal is then applied to Pin E of plug P201 on the R-442 through the R-442 to the AF assembly A5000. One signal output from AF assembly A5000 is sent through the R-442 muting relay K5001 to Pin E of the R-442 audio jacks J104 and J103. The unmuted output of AF assembly A5000 is sent to Pin B of the R-442 audio jacks J104 and J103. The unmuted signal also is applied to Pin S of the R-442 plug P201. The signal is then applied to Pin S of the MT-1898 jack J14, then through the MT-1898 PHONE OUT circuit to Pin H of the MT-1898 jack J12. The signal is then applied to Pin H of plug P1 of the J-3514 cable, through the J-3514 to Contact 15 of the J-3514 circuit board, through resistor R3, back to Contact 14 of the J-3514 circuit board and on to Pin B of jack J3, on the J-3514. The signal is then applied to Pin B of plug P1 of the CX-13061/U cable, through the CX-13061/U cable to Pin B of plug P2 of the CX-13063/U cable. From Pin B of plug P2 of the CX-13061/U cable, the signal is applied to Pin C of the KY-57 jack J3. Then the signal is sent through the KY-57 to relay K3A, in the plaintext (P) position, through the K3A relay to Pin B of the KY-57 audio jack J1.


KY-57
HYP-57
VOLUME
ON
OFF
FILL
AUDIO
TD
POWER ON RESET
CB101
CR101
TO DIAL LAMP
CRYSTAL REFERENCE SYSTEM
OSCILLATOR ASSEMBLY A2000
CRS ASSEMBLY A3000
RCVR RF ASSEMBLY A1000
IF ASSEMBLY A4000
BAND
30-52
53 75
+18 VDC REF OPERATING VOLTAGE
X MODE IN
X MODE OUT
REMOTE DIRECT +22 TO 30 V DC IN
PHONE OUT
MONITOR OUT
RCVR SPKR MUTE IN
SPEAKER OUT
SQUELCH DISAB
F11 100 AMP
TB2
J11
P11
*CX-4721
K1
K2
K3
K4
K5
S1A
S1B
S1C
S1D
J1
P2
TO TD CONTROL
POWER SUPPLY
BA1372
INTERNAL BATTERY

1. (See Figure 95.) When COMSEC (VINSON) equipment is used with the radio system R-442 receiver, the receive signal path (plaintext) is as follows: The received signal is intercepted by the R-442 antenna elements, sent through the AB-15 antenna base through the CG-1773/U RF cable, and applied to the R-442 antenna jack. The signal is then sent through the RCVR RF assembly A1000, through IF assembly A4000, and through the X-MODE switch and then is applied to Pin L of the R-442 plug P201. The signal is then applied to Pin L of the MT-1898 mount through the MT-1898 X-MODE IN circuit and applied to Pin D of the MT-1989 jack J12. Then the signal is applied to Pin D of plug P1 of the J-3514 cable. The signal is then sent through Contact 4 of the J-3514 circuit board to contact B3 of relay K2, through contact B2 of relay K2, back through Contact 2 of the J-3514 circuit board to Pin E of P1 of the J-3514 cable. The signal is then applied to Pin E of the MT-1898 jack J12, through the MT-1898S X-MODE OUT circuit to Pin E of the MT-1898 jack J14. The signal is then applied to Pin E of plug P201 on the R-442 through the R-442 to the AF assembly A5000. One signal output from AF assembly A5000 is sent through the R-442 muting relay K5001 to Pin E of the R-442 audio jacks J104 and J103. The unmuted output of AF assembly A5000 is sent to Pin B of the R-442 audio jacks J104 and J103. The unmuted signal also is applied to Pin S of the R-442 plug P201. The signal is then applied to Pin S of the MT-1898 jack J14, then through the MT-1898 PHONE OUT circuit to Pin H of the MT-1898 jack J12. The signal is then applied to Pin H of plug P1 of the J-3514 cable, through the J-3514 to Contact 15 of the J-3514 circuit board, through resistor R3, back to Contact 14 of the J-3514 circuit board and on to Pin B of jack J3, on the J-3514. The signal is then applied to Pin B of plug P1 of the CX-13061/U cable, through the CX-13061/U cable to Pin B of plug P2 of the CX-13063/U cable. From Pin B of plug P2 of the CX-13061/U cable, the signal is applied to Pin C of the KY-57 jack J3. Then the signal is sent through the KY-57 to relay K3A, in the plaintext (P) position, through the K3A relay to Pin B of the KY-57 audio jack J1.

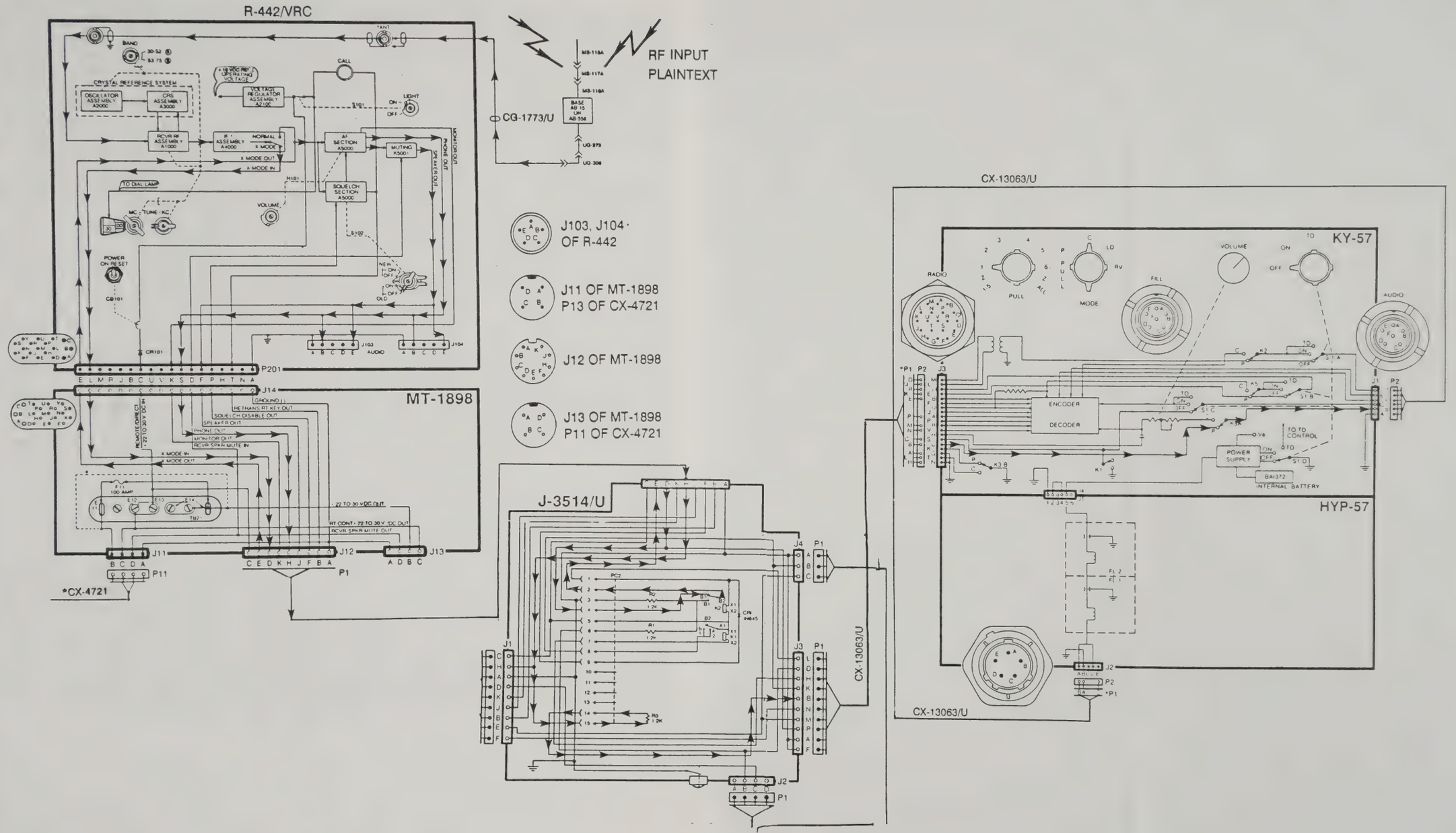
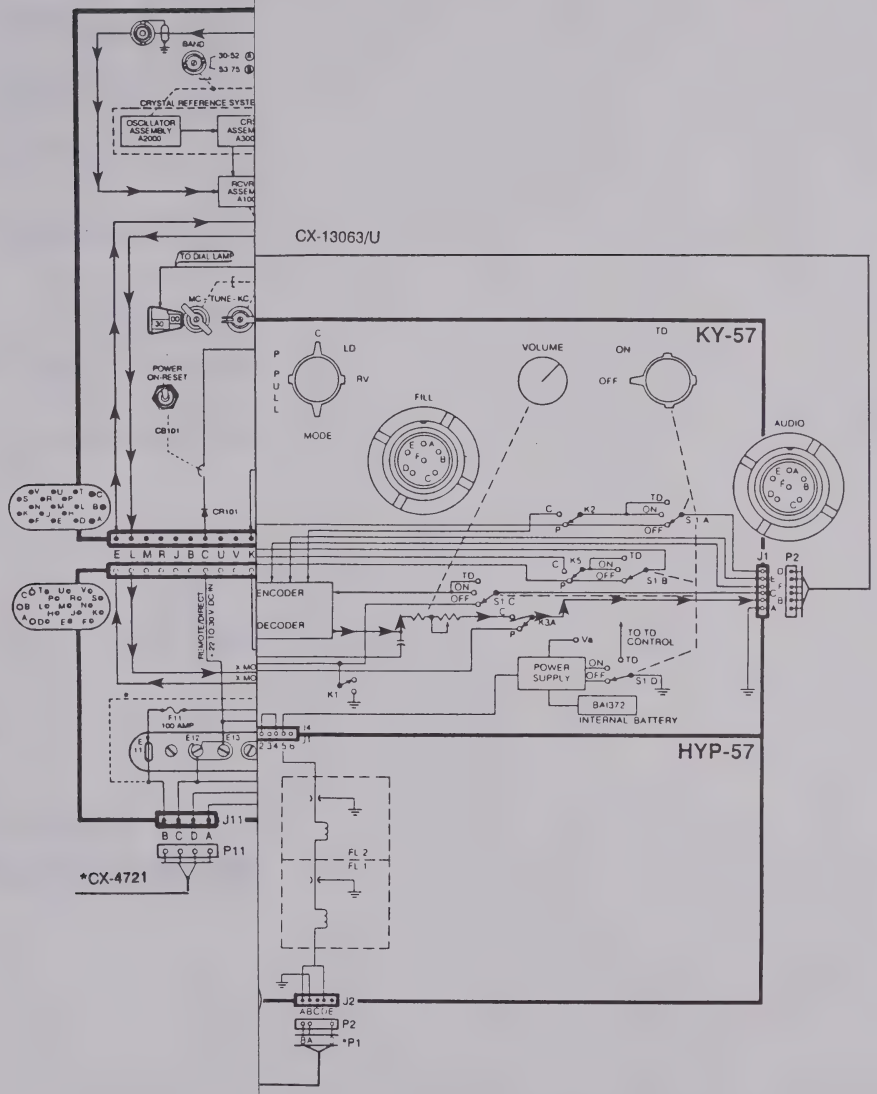


Figure 95. VINSON secured RT-442/VRC receive plaintext audio circuits.

m. (See Figure 96.) When COMSEC (VINSON) equipment is used with the radio system R-442 receiver, the receive signal path (cipher text) is as follows: The received signal is intercepted by the R-442 antenna elements, sent through the AB-15 antenna base through the CG-1773/U RF cable and is applied to the R-442 antenna jack. The signal is then sent through the RCVR RF assembly A1000, and through the IF assembly and A4000, and through the X-MODE switch and then is applied to Pin L of the R-442 plug P201. The signal is then applied to Pin L of the MT-1898 jack J14 through the mount X-MODE IN circuit to Pin D of the mount jack J12. From Pin D of J12, the signal is applied to Pin D of plug P1 of the J-3514/U cable through this cable to a tie point. From this tie point, the signal goes in two directions. First, the signal is sent through the J-3514 circuit board Contact 4 to Contact B3 of relay K2. This relay contact is open, so the signal stops there. At the same time, the signal is sent from the Pin D circuit tie point right to Pin P of the J-3514 jack J3, then is applied to Pin P of plug P1 of the CX-13061/U cable and through this cable to Pin P of this cable plug P2. The signal at Pin P of P2 is applied to Pin A of jack J3 on the KY-57. The signal is applied from Pin A of J3 to a sensor section in the KY-57. At this time, the ciphered signal is sensed and a beep is heard in the phone element of the handset and relay K3-B contact arm is caused to move from P (plaintext position) to C (cipher text position), which is a ground. This grounding of K3-B relay is applied to Pin T of J3, then to Pin L of P2 of the CX-13061/U cable, then through this cable to Pin L of P1, then to Pin L of jack J3 of the J-3514/U, then through the J-3514/U to Contact 1 of the J-3514/U circuit board, and then to a tie point that applies the ground to the J-3514/U relay K2. This causes the K2 relay arm B2 to move from Contact B3 to Contact B1. At the same time, the signal sensed by the KY-57 sensor section is sent to the KY-57 DECODER where the signal is decoded and sent first through the KY-57 volume control. The signal is then sent through the K3A relay C cipher contact (this contact was caused to move from its P position to its C position when the KY-57 sensor sensed the ciphered signal) and then through the KY-57 to Pin B of the KY-57 jack J1. This decoded (plaintext) signal is now applied to Pin B of plug P2 on the CX-13062/U cable, and then through this cable to Pin B of cable CX-13062/U plug P1. This signal is now applied to Pin B of the J-3514/U jack J2, through the J-3514/U to Contact 6 of the J-3514/U circuit board, to Contact B1 of relay K2, through K2 relay Contact B2, to Contact 2 of the J-3514/U circuit board, and then on to Pin E of the J-3514/U cable plug P1. The signal is then applied to Pin E of the MT-1898 mount, through the mount X-MODE OUT circuit to Pin E of jack J14 and is then applied to Pin E of the R-442 plug P201. From Pin E of plug P201, the signal is sent to the input of A5000 assembly. The signal is then sent out of assembly A5000 in two directions, one is the unmuted circuit and it applies its signal to Pin B of the R-442 audio jacks J103 and J104. The second output is through the A5000 muting circuit and then to Pin E of the R-442 audio jacks J103 and J104. Both outputs from the AF assembly A5000 can be monitored at the two audio jacks by using an audio reproducer, such as an H-250 or H189 handset or an H-140 headset or an LS-454 speaker.


CX-13063/U
KY-57
HYP-57
*CX-4721
TO DIAL LAMP
POWER ON-RESET
CB101
CR101
MODE
VOLUME
FILL
AUDIO
ENCODER
DECODER
REMOTE DIRECT
POWER SUPPLY
TO TD CONTROL
BA1372
INTERNAL BATTERY
100 AMP
J11
P11
J2
P2
*P1
FL 2
FL 1

m. (See Figure 96.) When COMSEC (VINSON) equipment is used with the radio system R-442 receiver, the receive signal path (cipher text) is as follows: The received signal is intercepted by the R-442 antenna elements, sent through the AB-15 antenna base through the CG-1773/U RF cable and is applied to the R-442 antenna jack. The signal is then sent through the RCVR RF assembly A1000, and through the IF assembly and A4000, and through the X-MODE switch and then is applied to Pin L of the R-442 plug P201. The signal is then applied to Pin L of the MT-1898 jack J14 through the mount X-MODE IN circuit to Pin D of the mount jack J12. From Pin D of J12, the signal is applied to Pin D of plug P1 of the J-3514/U cable through this cable to a tie point. From this tie point, the signal goes in two directions. First, the signal is sent through the J-3514 circuit board Contact 4 to Contact B3 of relay K2. This relay contact is open, so the signal stops there. At the same time, the signal is sent from the Pin D circuit tie point right to Pin P of the J-3514 jack J3, then is applied to Pin P of plug P1 of the CX-13061/U cable and through this cable to Pin P of this cable plug P2. The signal at Pin P of P2 is applied to Pin A of jack J3 on the KY-57. The signal is applied from Pin A of J3 to a sensor section in the KY-57. At this time, the ciphered signal is sensed and a beep is heard in the phone element of the handset and relay K3-B contact arm is caused to move from P (plaintext position) to C (cipher text position), which is a ground. This grounding of K3-B relay is applied to Pin T of J3, then to Pin L of P2 of the CX-13061/U cable, then through this cable to Pin L of P1, then to Pin L of jack J3 of the J-3514/U, then through the J-3514/U to Contact 1 of the J-3514/U circuit board, and then to a tie point that applies the ground to the J-3514/U relay K2. This causes the K2 relay arm B2 to move from Contact B3 to Contact B1. At the same time, the signal sensed by the KY-57 sensor section is sent to the KY-57 DECODER where the signal is decoded and sent first through the KY-57 volume control. The signal is then sent through the K3A relay C cipher contact (this contact was caused to move from its P position to its C position when the KY-57 sensor sensed the ciphered signal) and then through the KY-57 to Pin B of the KY-57 jack J1. This decoded (plaintext) signal is now applied to Pin B of plug P2 on the CX-13062/U cable, and then through this cable to Pin B of cable CX-13062/U plug P1. This signal is now applied to Pin B of the J-3514/U jack J2, through the J-3514/U to Contact 6 of the J-3514/U circuit board, to Contact B1 of relay K2, through K2 relay Contact B2, to Contact 2 of the J-3514/U circuit board, and then on to Pin E of the J-3514/U cable plug P1. The signal is then applied to Pin E of the MT-1898 mount, through the mount X-MODE OUT circuit to Pin E of jack J14 and is then applied to Pin E of the R-442 plug P201. From Pin E of plug P201, the signal is sent to the input of A5000 assembly. The signal is then sent out of assembly A5000 in two directions, one is the unmuted circuit and it applies its signal to Pin B of the R-442 audio jacks J103 and J104. The second output is through the A5000 muting circuit and then to Pin E of the R-442 audio jacks J103 and J104. Both outputs from the AF assembly A5000 can be monitored at the two audio jacks by using an audio reproducer, such as an H-250 or H189 handset or an H-140 headset or an LS-454 speaker.

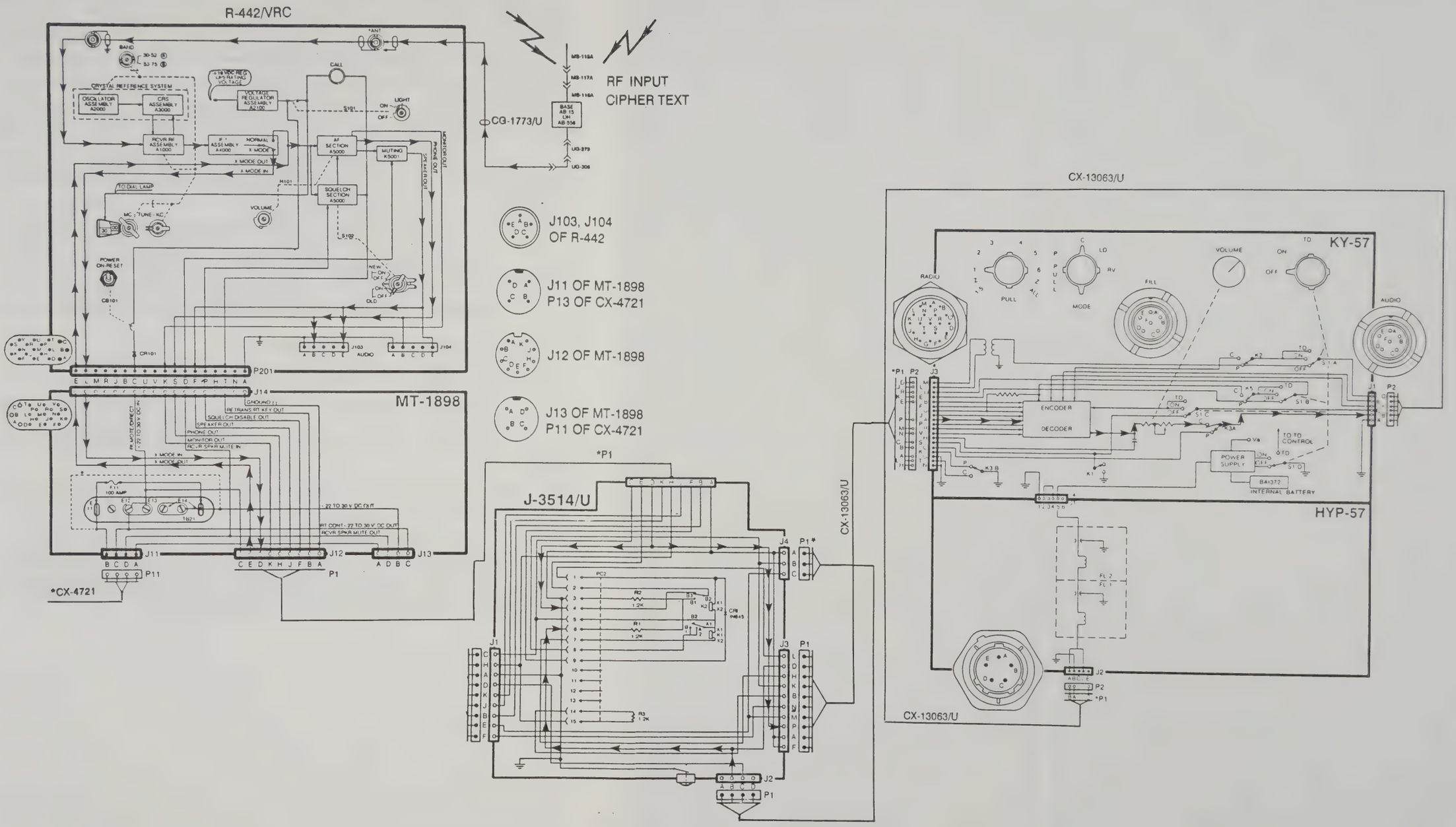


Figure 96. VINSON secured RT-442/VRC receive cipher text circuits.

16. TROUBLESHOOTING METHODS FOR RECEIVE SIGNAL PATH SYMPTOMS OF TROUBLE. It is now time to look at the troubleshooting methods that apply to an AN/VRC-12 series radio with COMSEC equipment that displays receive signal path symptoms of trouble. The key to identifying receive signal path troubles is the AN/VRC-12 series radio set with COMSEC equipment operational check. The operational check (Appendix) evaluates the overall operation of six of the eight configurations of the AN/VRC-12 series radio sets. For the remainder of this learning event, we will only be concerned with the operational checks EPC (operational performance checklist) steps that check only an RT and a receiver (R-442) receive signal path function.

a. After it has been determined that a trouble <u>does</u> exist within a radio component, you must next trace the suspect circuit on the appropriate diagram to determine how it is supposed to work.

(1) Determine what items of equipment are being used.

(2) Determine what troubleshooting method will be used to find the actual bad item of equipment.

b. Remember, before checking the operation of a radio set, you must--

(1) Do initial adjustments.

(2) Verify the radio set installation.

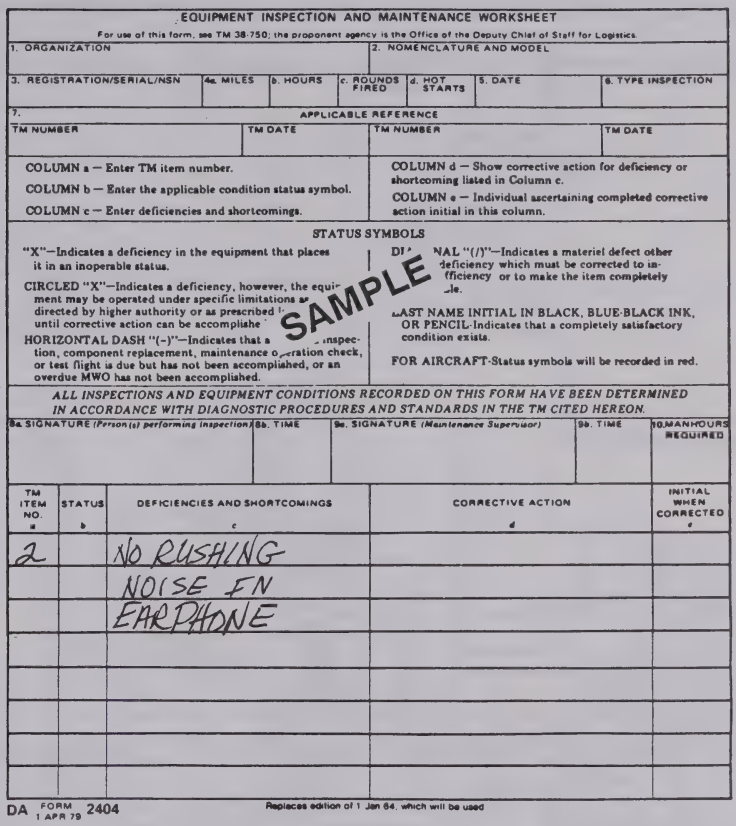
(3) Do all presets.

(4) Cable test set to radio (AN/PRM-34) and then do the EPC step actions.

NOTE: The AN/PRM-34 will be used in checking the RT-524 and R-442 receive signal path operation in this learning event.

c. (Read step 2 of the Appendix and then return to the text.) Step 2 is the first op check step that checks the system receive signal path. As described by step 2, the normal indication in this step is: <u>loud rushing noise from RT speaker and headset</u>. As described in step 2, the loudness of the rushing noise is controlled by the position of the RT VOLUME control.

d. If EPC step 2 is bad, the abnormal indication shown in Figure 97 will occur.



EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38-750; the proponent agency is the Office of the Deputy Chief of Staff for Logistics.

1. ORGANIZATION				2. NOMENCLATURE AND MODEL		
3. REGISTRATION/SERIAL/NSN	4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION

7. APPLICABLE REFERENCE			
TM NUMBER	TM DATE	TM NUMBER	TM DATE

COLUMN a — Enter TM item number.

COLUMN b — Enter the applicable condition status symbol.

COLUMN c — Enter deficiencies and shortcomings.

COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X"—Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X"—Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed in the manual until corrective action can be accomplished.

HORIZONTAL DASH "(–)"—Indicates that a ... inspection, component replacement, maintenance operation check, or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)"—Indicates a materiel defect other than deficiency which must be corrected to increase efficiency or to make the item completely operable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL-Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT-Status symbols will be recorded in red.

SAMPLE

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED

TM ITEM NO. a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
2		NO RUSHING		
		NOISE IN		
		EARPHONE		

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Figure 97. EPC step 2--possible bad indication.

(1) Let us now identify which item(s) of equipment, if defective, would cause the abnormal indication(s) to occur. (See Figure 98.)

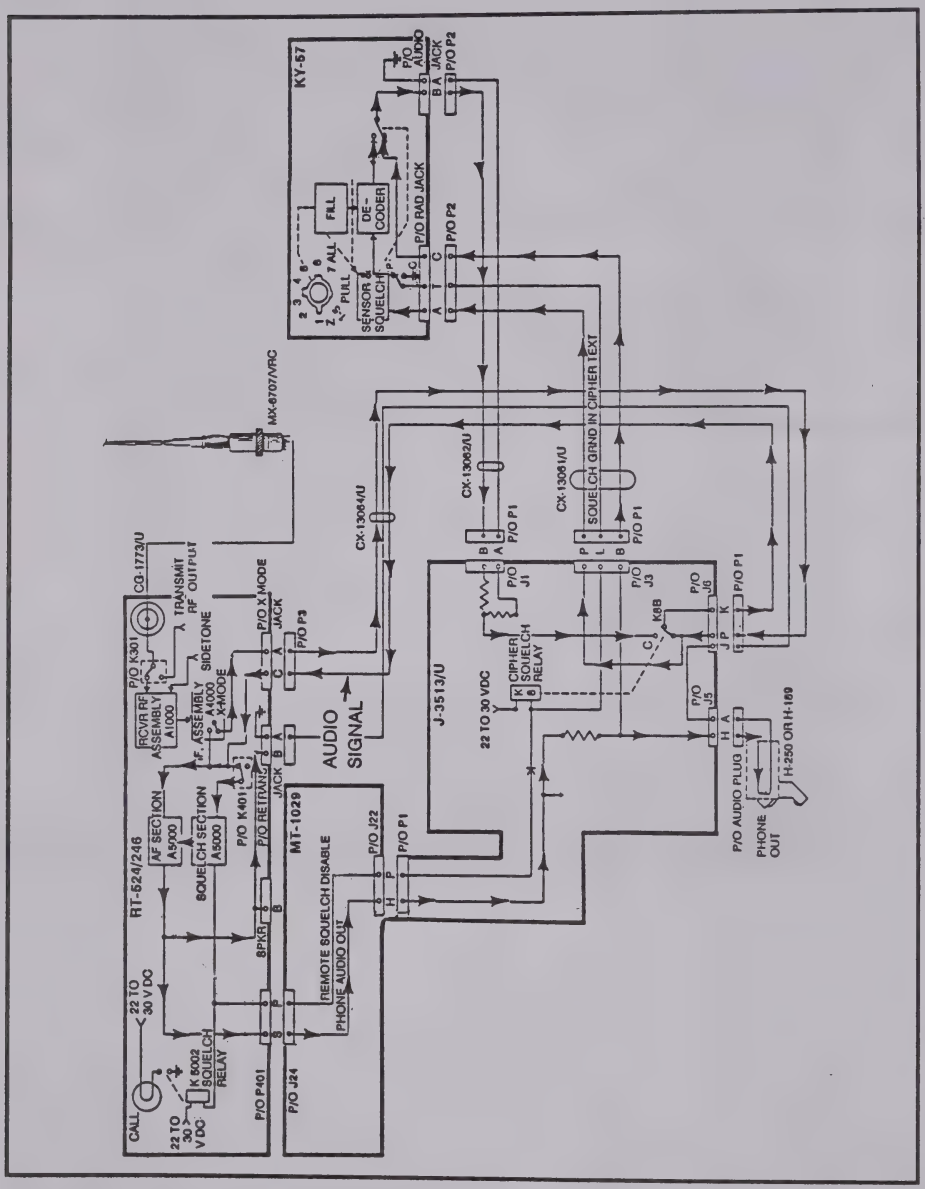

Figure 98. RT-524/VRC (RT-246/VRC) (secured with VINSON) rush noise path.

The possible bad items of equipment are: the RT unit, MT-1029, J-3513/U, handset, CX-13061/U cable, CX-13062/U cable, CX-13064/U cable, or the KY-57. To identify the actual bad item of equipment, first remove the handset and do a circuit disturbance check. (See Figure 99.)

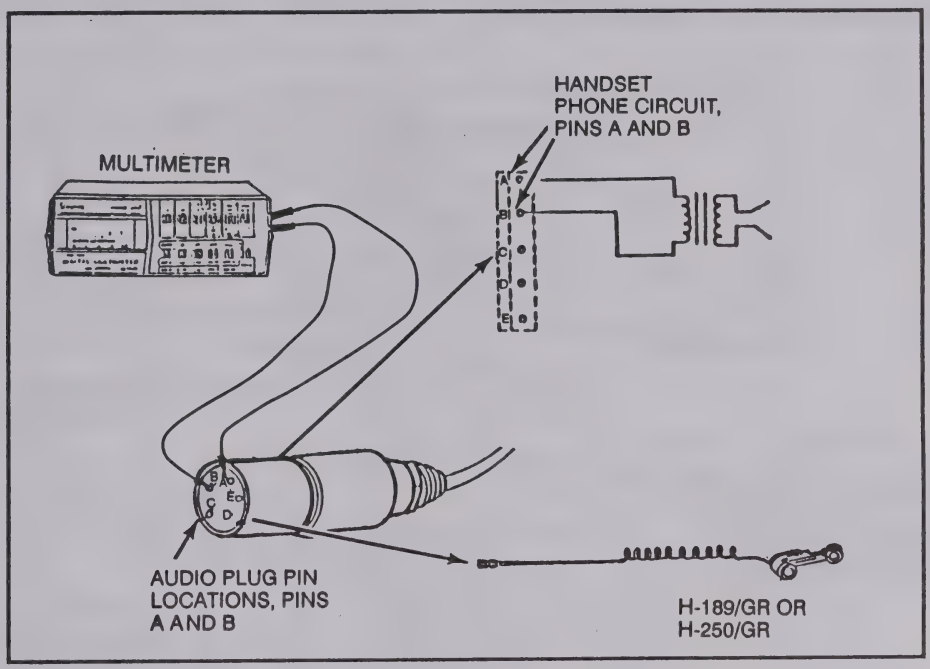

Figure 99. Handset up for circuit disturbance test of phone circuit.

(a) Set up the AN/PSM-45 as an ohmmeter.

(b) Remove the handset from the J-3513/U, and locate Pins A and B on the handset audio plug.

(c) Place one of the meter test leads on Pin A and then tap Pin B with the other test lead of the meter. With the handset held next to your ear when tapping Pin B, a clicking sound should be heard in the phone element if the handset is good. If a clicking sound is not heard, the handset is defective and must be replaced.

(2) If the handset checks good, the next action is to remove the CX-13064/U cable from the RT X-MODE jack and from the RT RETRANS jack, install the X-MODE cap on the X-MODE jack, connect the handset to the RT RETRANS jack, and listen for rush noise in the handset phone element. (See Figure 100.)

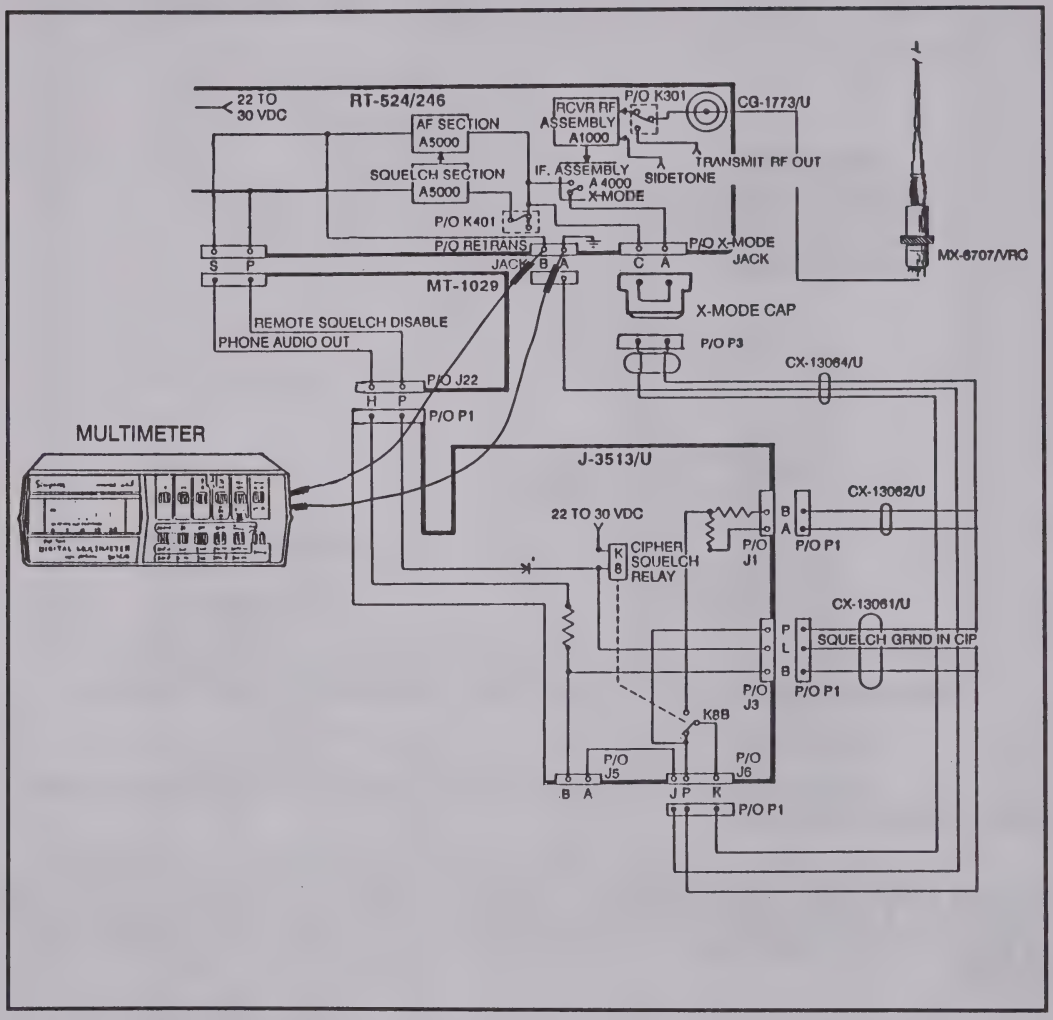

Figure 100. Audio output check of RT--X-MODE plug installed and handset connected to RT RETRANS jack.

(a) If rush noise was heard when you checked at the RT RETRANS jack, the RT is good. However, if no rush noise is heard when making this check, the possible bad items of equipment are: RT unit, MT-1029, and J-3513 junction box. To determine which item is actually bad, first remove the handset from the RT RETRANS jack, set up your multimeter to measure resistance on the 20K ohms range and make a measurement between Pins A and B of the RT RETRANS jack. (See Figure 101.)

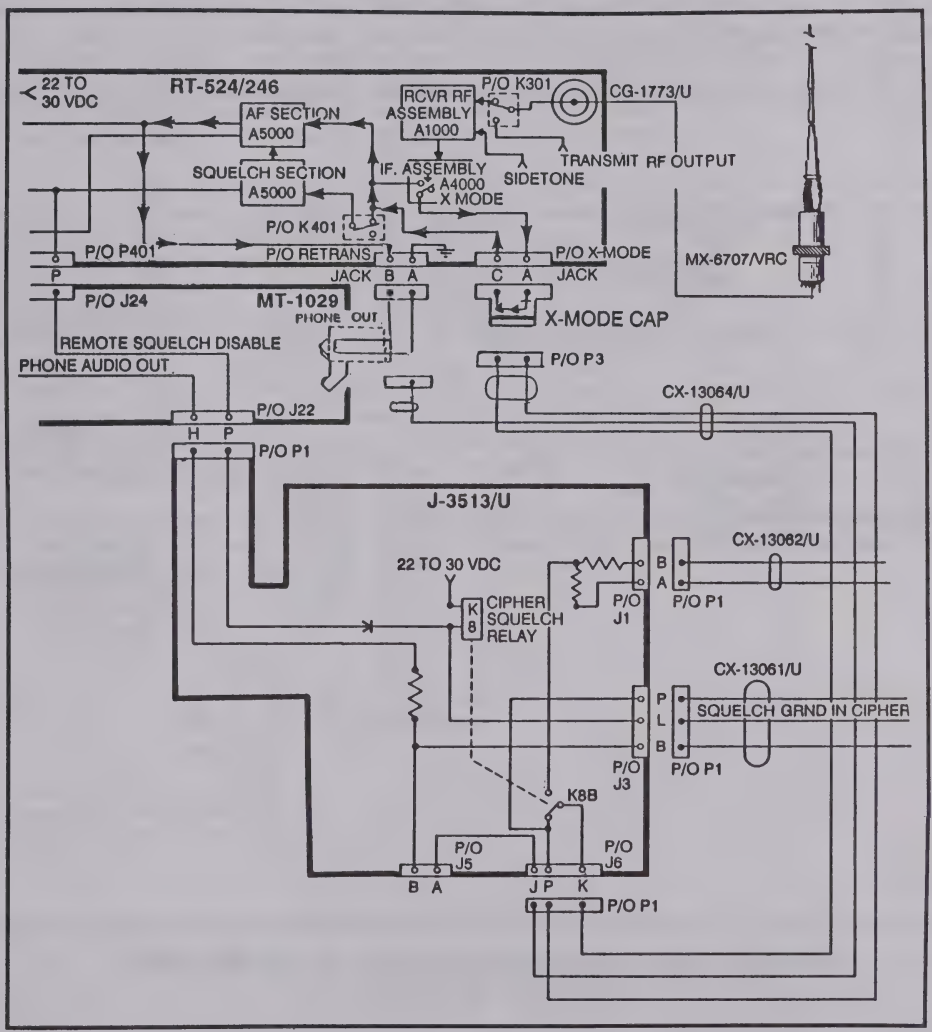

Figure 101. Resistance check between Pins A and B of RT RETRANS jack.

(b) If the meter display showed a reading that was less than 2,000 ohms or greater than 3,000 ohms, you would remove the RT from its mount and make this measurement again. Now, if the meter displayed a reading greater than 3,000 ohms, the RT is bad and it would be sent to IDS, with a DA Form 2407, for repairs. However, if the meter display showed less than 2,000 ohms, when making this measurement with the RT removed from its mount, the possible bad items would be the MT-1029 or the J-3513. To determine which is bad, a resistance measurement would be made from Pin S of J24 on the MT-1029 mount to Pin B of J5 on the J-3513 junction box. (See Figure 102.)

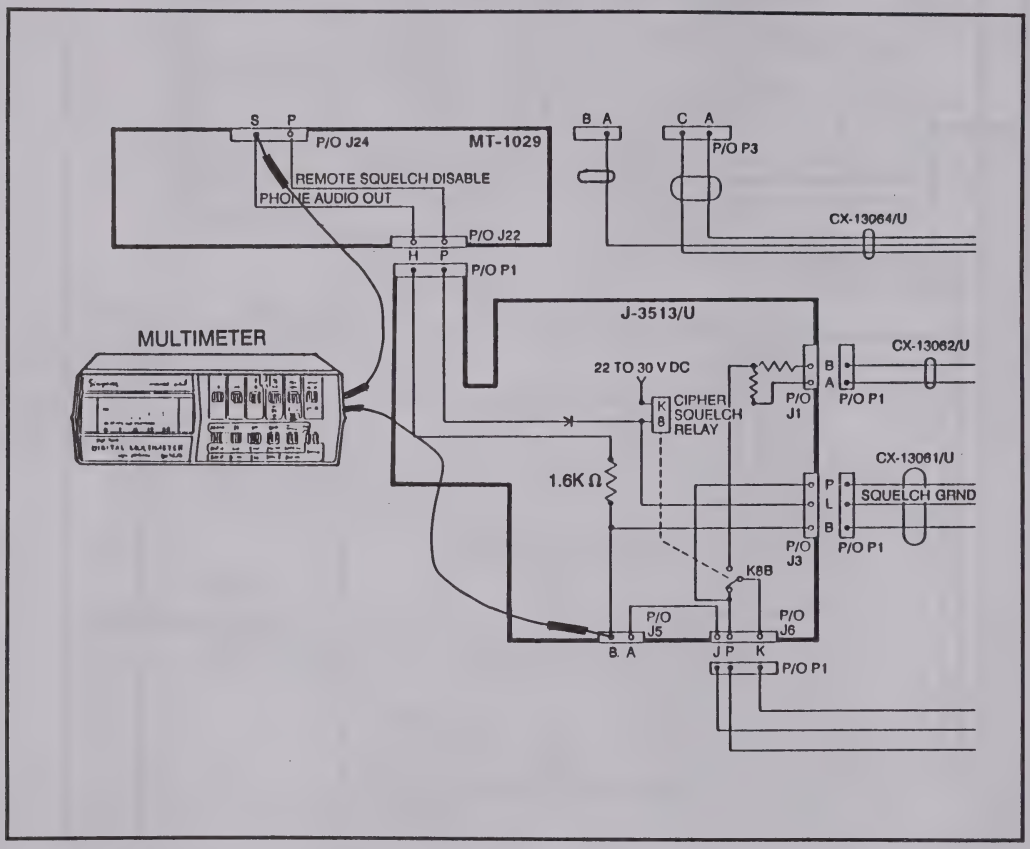

Figure 102. Resistance check from Pin S of J24 (MT-1029) to Pin B of J5 (J-3513).

(c) If the meter indicated 1,600 ohms, the MT-1029 and the J-3513 junction box are both good. However, if the meter indicated infinite ohms, either the MT-1029 from Pin S of the J24 to Pin H of J22 or the J-3513 from Pin H of P1 to Pin B of J5 is open. (Refer to Figure 102 to see these two circuits.) When making continuity checks between Pin S of J24 and Pin H of J22, if the meter indicates infinite ohms, the circuit is open and it would be repaired if possible. If it cannot be repaired, the mount would be sent to IDS, with a completed DA Form 2407, for repairs. If the meter indicated 0 ohms, when checking from Pin S of J24 to Pin H of J22, the mount is good and the J-3513 would be checked from Pin H of P1 to Pin B of J5 on the J-3513. When making the check through the J-3513, if the meter indicates 1,600 ohms, the circuit is good. However, if the meter indicates infinite ohms, the circuit is open and the J-3513 would be turned in to COMSEC maintenance, with the appropriate maintenance request form(s) for repairs.

(d) (See Figure 103.) If all of the checks of the rush noise path, up to this point, have been good, the CX-13064/U cable must be checked for an open. With the meter set up for resistance checks, locate Pins C and A of plug P3 on the CX-13064/U and make a continuity check between these two Pins.
If the meter indicates 0 ohms when making this check, the C and A circuits through the CX-13064/U cable and through Pin P, K8B relay, and Pin H of jack J6 are good. However, if the meter indicated infinite ohms, these two items must be checked separately; that is, continuity checks on the CX-13064/U cable, Pin A of P3 to Pin K of P1 and Pin C of P3 to Pin P of P1 (if either check is infinite ohms, cable would be replaced and the bad cable turned in to COMSEC maintenance), and Pin P of J6 to Pin K of J6 (if infinite ohms, the J-3513/U would be sent to COMSEC maintenance, with the appropriate maintenance forms, for repairs).

NOTE: There are three additional items of equipment that if shorted would cause the system to have no rush noise. These items are the CX-13061/U cable, the CX-13062/U cable, and the KY-57.

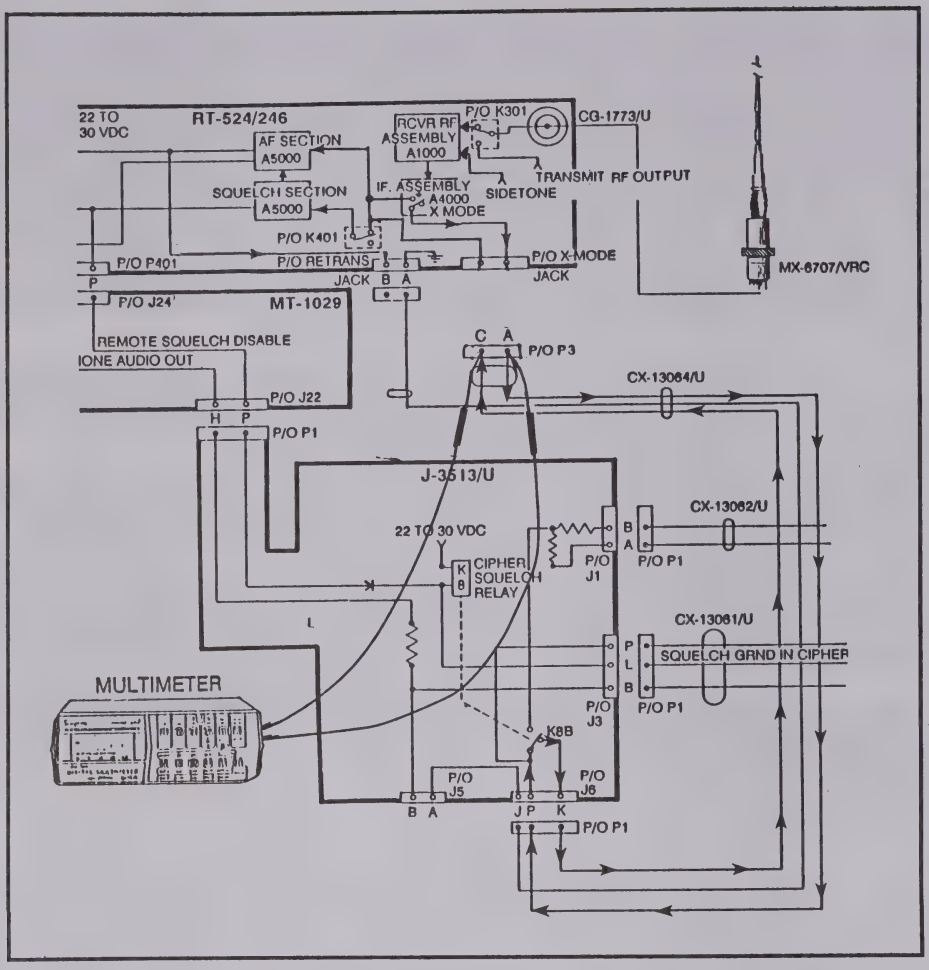

Figure 103. Continuity check of rush noise path through CX-13064/U cable and jack J6 of J-3513/U.

(e) When you check the CX-13061/U cable (see Figure 104) from Pin C to Pin G of P2 for a short and the meter indicates infinite ohms, the cable is good. However, if the meter indicates 0 ohms, you must disconnect the cable from J3 of the J-3513/U and the cable must be checked again for a short between Pins C and G of plug P2. If the CX-13061/U cable still indicates a short, you must send it to COMSEC maintenance for repair. If the CX-13061/U cable checked good, you check the CX-13062/U cable for a short. (Refer to Figure 104) the CX-13062/U cable would be disconnected from the KY-57 AUDIO JACK and, on plug P2, Pins B and A would be located. Using an ohmmeter, you make a shorts test between Pins B and A. If the meter indicates 0 ohms, disconnect the other end of the CX-13062/U cable from jack J1 of the J-3513/U and repeat the shorts test between Pins B and A of P2. If the meter still indicates a short, 0 ohms, the cable is bad and you must send it to COMSEC maintenance for repairs. However, if the meter indicated infinite ohms when checking between pins B and A of P2 with the other end of the cable connected to J1 on the J-3513/U, the cable is good and the only item of equipment that could be bad is the KY-57. If you determine that the KY-57 is bad, it will be sent to COMSEC maintenance, with the appropriate maintenance request forms, for repair.

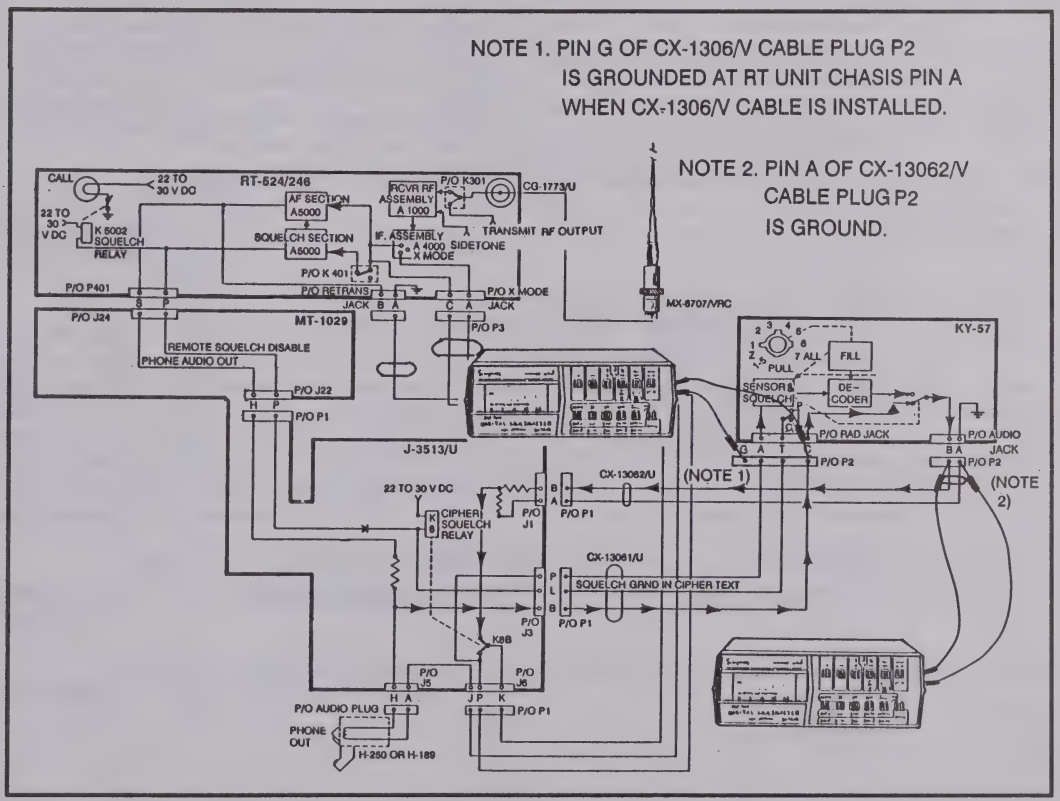

Figure 104. Shorts test of CX-13061/U cable rush noise path--Pin C to Pin G.

e. (Read step 4 of the Appendix, and then return to the text.) Step 4 checks the receive signal path function of the squelch control and CALL lamp operations.

(1) If step 4 is good, all indications, 4a, 4b, and 4c, will occur. If step 4 is bad, the abnormal indication listed on the DA Form 2404 in Figure 105 will occur.

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38-750; the proponent agency is the Office of the Deputy Chief of Staff for Logistics

1. ORGANIZATION				2. NOMENCLATURE AND MODEL		
3. REGISTRATION/SERIAL/NSN	4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION

7. APPLICABLE REFERENCE			
TM NUMBER	TM DATE	TM NUMBER	TM DATE

COLUMN a — Enter TM item number.

COLUMN b — Enter the applicable condition status symbol.

COLUMN c — Enter deficiencies and shortcomings.

COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X"—Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X"—Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed [illegible] until corrective action can be accomplished.

HORIZONTAL DASH "(–)"—Indicates that a [illegible] inspection, component replacement, maintenance operation check, or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)"—Indicates a materiel defect other than deficiency which must be corrected to increase efficiency or to make the item completely operable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL-Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT-Status symbols will be recorded in red.

SAMPLE

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED

TM ITEM NO. a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
4b		RUSH NOISE IS HEARD AND CALL LAMP LIGHTS IN SQUELCH ON POSITIONS.		

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Figure 105. EPC step 4, abnormal indication.

(2) If EPC step 4 checks bad when operating in the PLAINTEXT mode, the possible bad items of equipment are the RT unit, the MT-1029 mount, the J-3513/U junction box, the CX-13061/U cable, or the TSEC/KY-57. (See Figure 106.) A short in the system squelch circuit to ground would cause the abnormal indication shown in Figure 105 to occur.

a. First, to see if the RT unit is bad or not, turn the RT unit POWER switch to its OFF position and remove the RT unit from the MT-1029 mount. Then set up the AN/PSM-45 multimeter to measure resistance on the 2K range. Now, locate Pins A and P on jack J24 of the MT-1029 mount, and place the meter black test lead in Pin A and the meter red test lead in Pin P. Observe the meter display. Reverse the meter test leads so that the black test lead is in Pin P and the red test lead is in Pin A, and again observe the meter display. If the meter displays infinite ohms for both of the measurements, the RT unit is bad. Send it to IDS with a complete DA Form 2407 for repair. However, if one of the above readings was 0 ohms or less than 950 ohms, the RT unit is not the bad item, but one of the remaining listed possible bad items is bad.

b. Make sure the meter test leads are connected to Pins A and P of J24, just like they were, when the meter displayed 0 ohms. Now, with the test leads connected between Pins A and P of J24, disconnect the CX-13061/U cable from the KY-57 RAD jack and observe the meter display. If the meter display no longer indicates a short, the KY-57 is the bad item of equipment and it will be turned in to COMSEC maintenance, with the appropriate maintenance request forms, for repair.

c. If the meter still indicates 0 ohms, disconnect the CX-13061/U cable from jack J3 of the J-3513/U junction box and observe the meter display now. If the meter no longer indicates 0 ohms, the CX-13061/U cable is bad and it must be sent to COMSEC maintenance for repair.

d. If the meter still indicates a short, only the J-3513/U or the MT-1029 can be bad. To determine which, the MT-1029 must be disassembled and the J-3513/U cable must be disconnected from jack J22 on the MT-1029. With the MT-1029 disassembled and the cable removed from jack J22, make a shorts test between Pins A and P of J24. A zero reading identifies the mount as bad. Repair it if possible, and if it is not possible, send it to IDS for repair. However, if the meter indicates infinite ohms, the MT-1029 is good and the J-3513/U junction box is bad. It will be sent, with the appropriate maintenance request forms, to COMSEC maintenance for repair.

f. (Read step 5 of the Appendix, and then return to the text.) EPC step 5 checks the RT receive sensitivity (reception) and the complete matching unit (MX) control.

(1) If EPC step 5 checks bad, the abnormal indications listed on the DA Form 2404 in Figure 107 could occur.

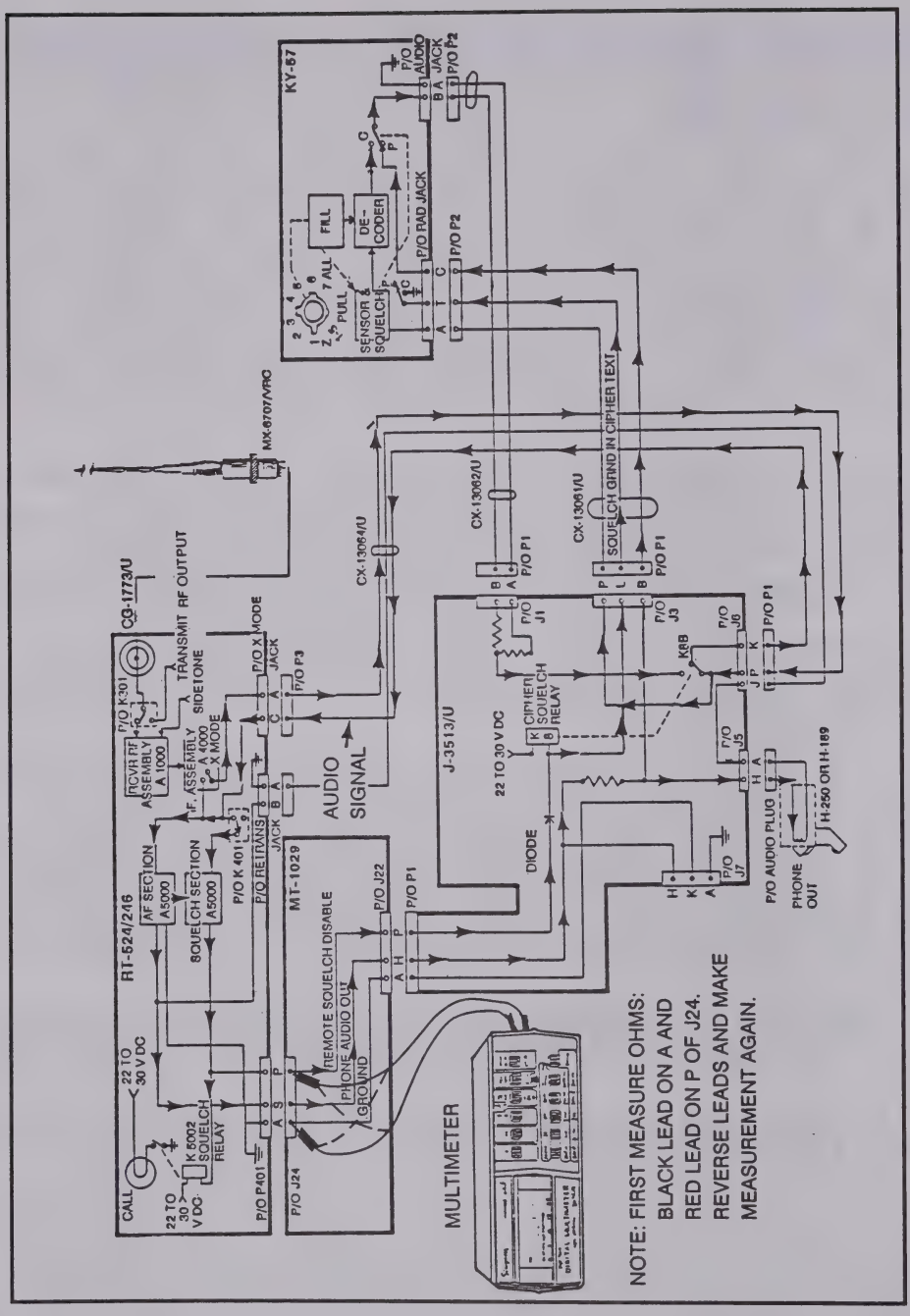
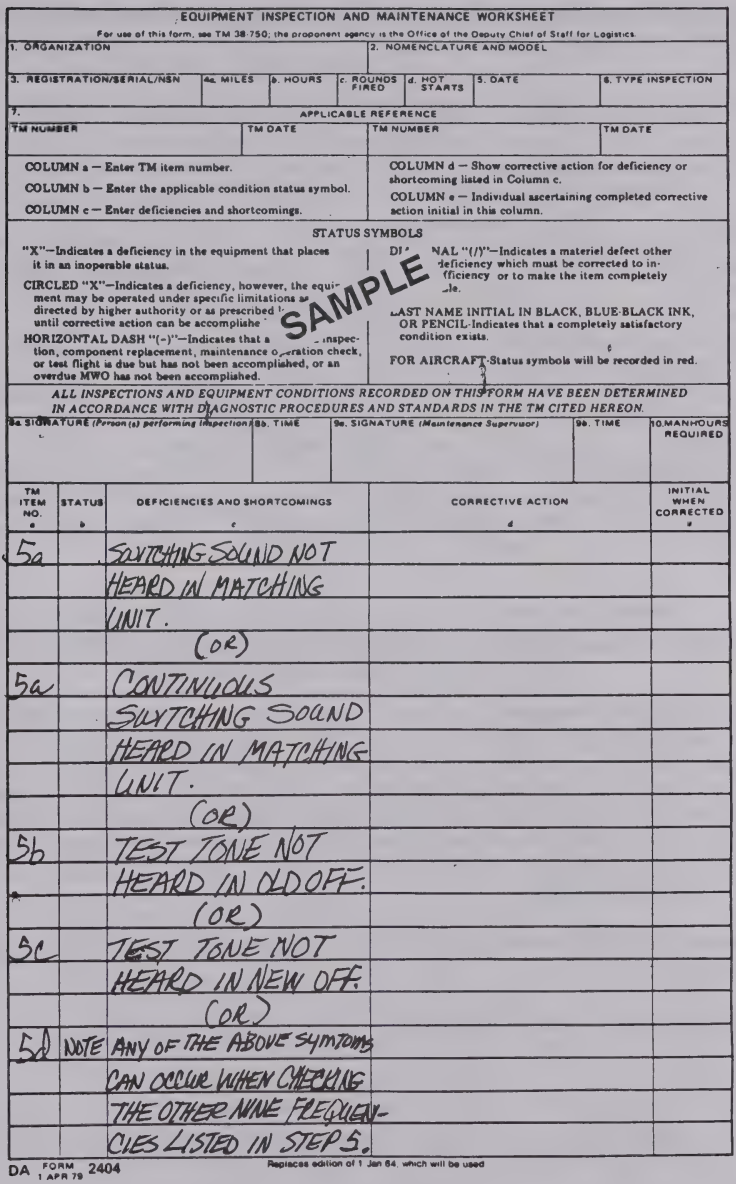


Figure 106. Squelch control and CALL lamp circuit checks.



EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38-750; the proponent agency is the Office of the Deputy Chief of Staff for Logistics.

1. ORGANIZATION | 2. NOMENCLATURE AND MODEL

3. REGISTRATION/SERIAL/NSN | 4a. MILES | b. HOURS | c. ROUNDS FIRED | d. HOT STARTS | 5. DATE | 6. TYPE INSPECTION

7. APPLICABLE REFERENCE

TM NUMBER	TM DATE	TM NUMBER	TM DATE

COLUMN a — Enter TM item number.

COLUMN b — Enter the applicable condition status symbol.

COLUMN c — Enter deficiencies and shortcomings.

COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X"—Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X"—Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed in ... until corrective action can be accomplished.

HORIZONTAL DASH "(-)"—Indicates that a ... inspection, component replacement, maintenance operation check, or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)"—Indicates a materiel defect other than deficiency which must be corrected to increase efficiency or to make the item completely operable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL-Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT-Status symbols will be recorded in red.

SAMPLE

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8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED

TM ITEM NO. a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
5a		SWITCHING SOUND NOT HEARD IN MATCHING UNIT.		
		(OR)		
5a		CONTINUOUS SWITCHING SOUND HEARD IN MATCHING UNIT.		
		(OR)		
5b		TEST TONE NOT HEARD IN OLD OFF.		
		(OR)		
5c		TEST TONE NOT HEARD IN NEW OFF.		
		(OR)		
5d		NOTE ANY OF THE ABOVE SYMPTOMS CAN OCCUR WHEN CHECKING THE OTHER NINE FREQUENCIES LISTED IN STEP 5.		

DA FORM 1 APR 79 2404 Replaces edition of 1 Jan 64, which will be used

Figure 107. EPC step 5, possible bad indications.

(2) If step 5 checks bad, the possible bad items of equipment must be identified. (See Figure 108.)

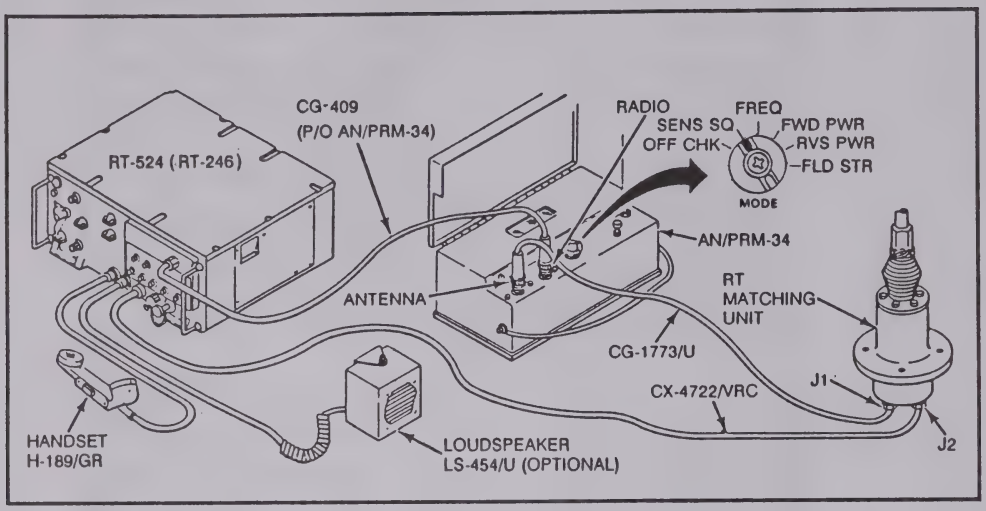

Figure 108. Components used to check Rt receive sensitivity and complete matching unit (MX) control.

When changing the RT frequency by more than 4 MHz, a control voltage is applied from the RT ANT CONT jack to and through the antenna control cable CX-4722 to the MX-6707 matching unit, causing it to select. When the AN/PRM-34 PUSH-TO-TEST button is pressed, the AN/PRM-34 produces a 900-Hz test tone and sends it through test set cable CG-409 and applies it to the RT antenna jack. The 900-Hz test tone is then applied to the RT unit receive circuits and is processed through the RT to the RT audio jacks where it is applied to the RT audio reproducers. The possible bad items of equipment are:

- Antenna AS-1729, to include the MX-6707 or antenna AT-912, to include the MX-2799.
- Antenna control cable CX-4722.
- RT unit.

(3) If, when checking step 5, the abnormal indications shown for step 5b and 5c in Figure 107 occur, the RT unit is the bad item of equipment and it will be sent to IDS, with a DA Form 2407, for repair.

(4) If, when checking step 5, the abnormal indications shown for step 5a and 5b, which could also occur when checking step 5d, occur, the RT matching unit control circuit is bad and the possible bad items of equipment would be the RT unit, the matching unit control cable CX-4722, or the matching unit MX-6707.

(a) If no switching occurs in the matching unit, when the RT frequency is changed by more than 4 MHz, a voltage is not getting from the RT through the CX-4722 to the MX-6707 as it should.

(b) If continuous switching occurs in the matching unit when the RT frequency is changed by more than 4 MHz, a voltage is getting from the RT through the CX-4722 to the MX-6707 that is not supposed to.

(c) If an abnormal indication of no switching occurs you must identify the frequency shown in the RT frequency window; for example, 44.40 MHz. Then, you check the matching unit control voltage chart to see which pins on jack J2 of the matching unit must have 24 VDC applied to them to make the MX-6707 select. (See Figure 109.)

FREQ MHz	BAND	PIN DESIGNATION							
		N	A	B	D	E	F	H	J
30-33	LOW	24	24	0	24	0	0	0	0
33-37	LOW	24	24	0	0	24	0	0	0
37-42	LOW	24	24	0	0	0	24	0	0
42-47.5	LOW	24	24	0	0	0	0	24	0
47.5-53	LOW	24	24	0	0	0	0	0	24
53-56	HIGH	24	0	24	24	0	0	0	0
56-60	HIGH	24	0	24	0	24	0	0	0
60-65	HIGH	24	0	24	0	0	24	0	0
65-70.5	HIGH	24	0	24	0	0	0	24	0
70.5-76	HIGH	24	0	24	0	0	0	0	24

MX-2799 ONLY

Figure 109. Antenna matching unit control voltage chart.

(d) Having identified, from the control voltage chart in Figure 109 that Pins N, A, and H of jack J2 on the MX-6707 must have voltage applied to them to make the MX-6707 select correctly, and we found out that the MX-6707 did not select correctly so we must find out which of Pins N, A, and H does not have this voltage on it. (See Figure 110.)

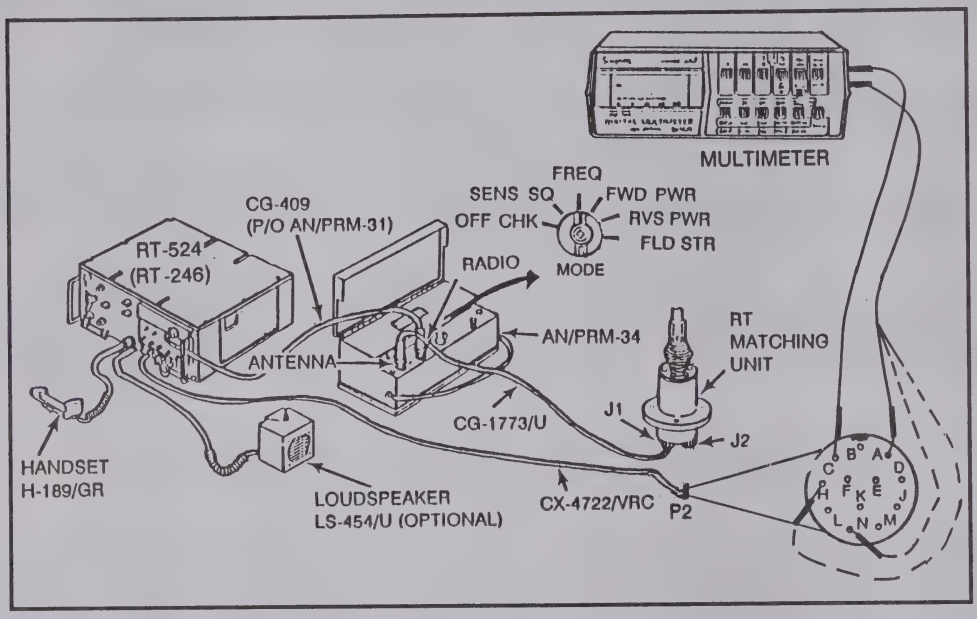

Figure 110. Matching unit control voltage checks on Pins N, A and H, at plug P2 of CX-4722 control voltage cable.

(e) To make these voltage measurements, the RT POWER switch is set to OFF and the CX-4722 cable is disconnected from jack J2, on the bottom of the MX-6707. Next, you set up the multimeter to measure DC voltage on the 200-volt range. Now, locate Pin C (ground) on plug P2, and insert the meter black test lead in Pin C, then, turn the RT POWER switch to LOW. Now, locate Pins N, A, and H and touch each of these pins with the meter red test lead, observing the meter display as each pin is touched with the red test lead. If Pins N, A, and H all showed 24 VDC, the MX-6707 is bad. It would be sent to IDS for repair, with a completed DA Form 2407. However, if one or more of these pins did not show 24 VDC, the MX-6707 is not bad, but either the CX-4722 cable or the RT unit is bad. To determine which is bad, the RT unit or the CX-4722 cable, you must make more voltage checks. (See Figure 111.)

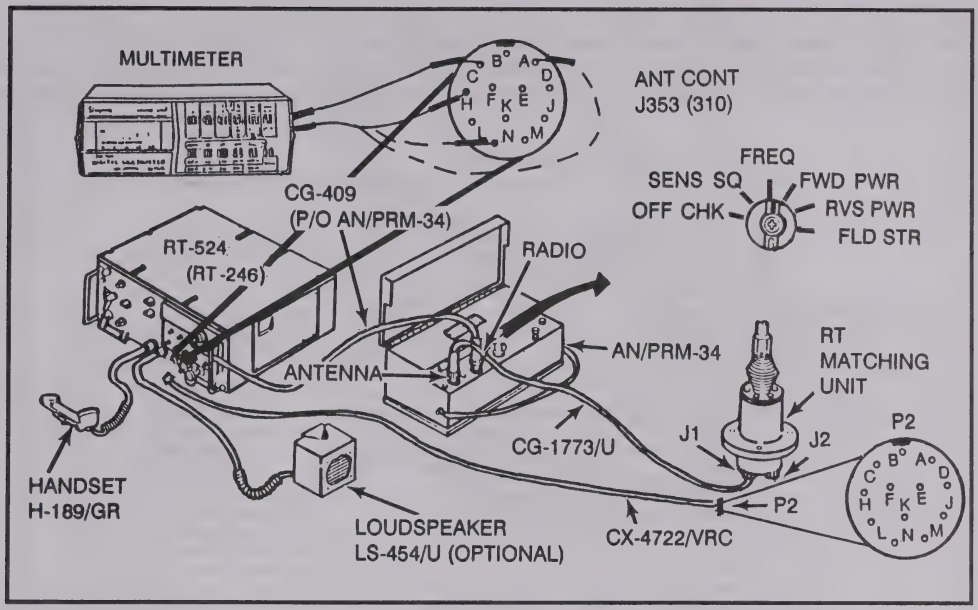

Figure 111. Matching unit control voltage checks on Pins N, A, and H at RT ANT CONT jack J353 (310).

(f) The next voltage test point is the RT unit ANT CONT jack, J353(310), at pins N, A, and H. First make sure that, in this case, 44.40 MHz is set on the RT unit. Next, set the RT POWER switch at OFF, and disconnect the CX-4722 cable from the RT unit ANT CONT jack. Now, set the RT unit POWER switch to LOW. Using the multimeter, place the meter black test lead on Pin C and with the meter red test lead, touch Pins N, A, and H one at a time and observe the meter display as each pin is touched. If one of these three pins, when touched with the meter test lead, does not cause the meter to indicate 24 VDC, the RT is bad and it will be sent to IDS, with a completed DA Form 2407, for repair. However, if all three readings indicated 24 VDC, the RT unit is not bad, but the CX-4722 control voltage cable is bad. The CX-4727 cable is an item that might possibly be repaired at unit level; therefore, the fault with the cable must be identified. (See Figure 112.)

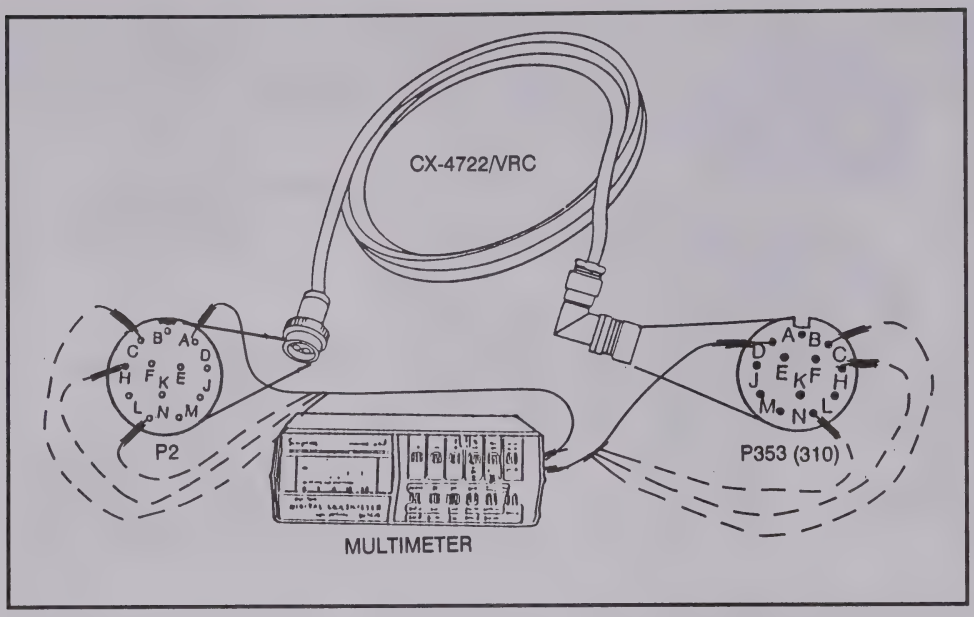

Figure 112. Continuity checks of CX-4722 cable circuits--N to N, A to A, H to H, and C to C.

(g) To identify the actual defect in the CX-4722; that is, which circuit is open, you make continuity checks through the cable from end to end, from Pin A of P2 to Pin A of P353, from Pin N of P2 to Pin N of P353, and from Pin H of P2 to Pin H of P353. One of the above measurements would produce an infinite reading on the meter display that would identify the defect in the cable. If possible, the cable would be repaired and the repair work done would be recorded on a DA Form 2404.

NOTE: It should be realized, before going on with the text, that the ground circuit Pin C of P2 to Pin C of P353 if open would remove all of the control voltages at plug P2 and at the same time all of the voltages, if measured, would be present at the RT ANT CONT jack J353(310).

(5) If, when you check matching unit control in EPC step 5, an abnormal indication of continuous selection occurs, the same items of equipment that can cause no selection, the RT unit, the CX-4722 cable, and the MX-6707 matching unit, if defective can also cause continuous selection. A voltage is being applied to the MX-6707 that should not be. (See Figure 113.)

FREQ MHz	BAND	PIN DESIGNATION							
		N	A	B	D	E	F	H	J
30-33	LOW	24	24	0	24	0	0	0	0
33-37	LOW	24	24	0	0	24	0	0	0
37-42	LOW	24	24	0	0	0	24	0	0
42-47.5	LOW	24	24	0	0	0	0	24	0
47.5-53	LOW	24	24	0	0	0	0	0	24
53-56	HIGH	24	0	24	24	0	0	0	0
56-60	HIGH	24	0	24	0	24	0	0	0
60-65	HIGH	24	0	24	0	0	24	0	0
65-70.5	HIGH	24	0	24	0	0	0	24	0
70.5-76	HIGH	24	0	24	0	0	0	0	24

MX-2799 ONLY

Figure 113. Antenna matching unit control voltage chart.

(a) If continuous selection does occur, turn the RT POWER switch off immediately. To identify the actual bad item of equipment, you would first check the antenna matching unit control voltage chart and identify which control voltage circuits should have voltage on them and which should not. Remember, we are still working with a frequency of 44.40 MHz. Looking at Figure 113 and starting with the fourth frequency range down, 42-47.5 MHz reading and working to the right, you see that the PIN DESIGNATION portion of this chart shows 0 for Pin B (Pin B is not used with the MX-6707), Pin D, Pin E, Pin F, and Pin J. Therefore, with a frequency of 44.40 MHz set on the RT, these four pins should have no voltage on them. (See Figure 114.)

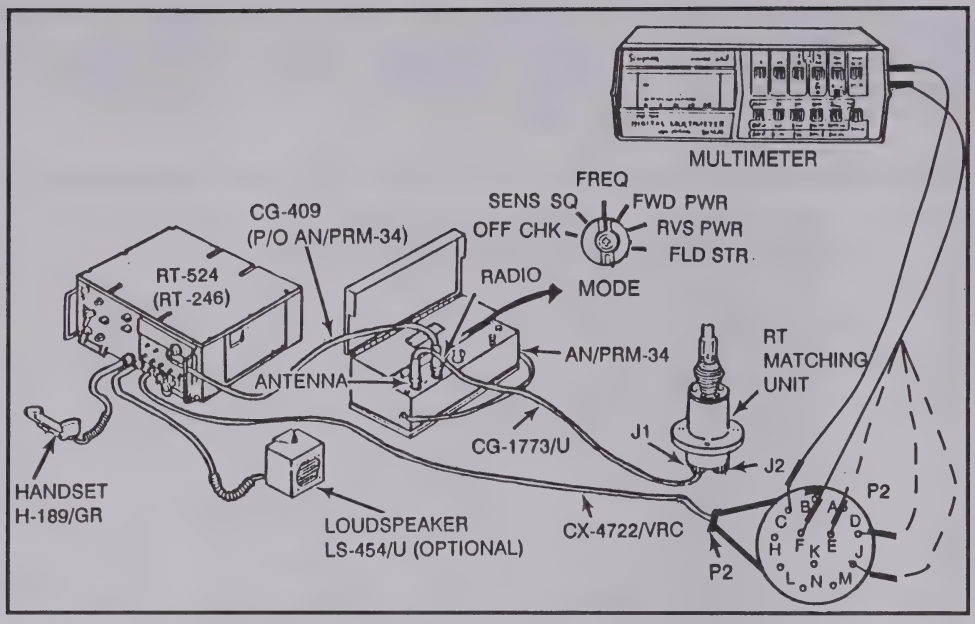

Figure 114. Voltage check on Pins D, E, F, and J of the CX-4722 cable plug P2.

(b) To identify the actual bad item of equipment, first make sure that the RT POWER switch is set to OFF. (Remember, as stated earlier in the text, if continuous selection occurs, turn the RT off immediately.) Disconnect the CX-4722 cable from jack J2 on the bottom of the MX-6707. Next, locate Pins D, E, F, and J on plug P2 of the CX-4722 cable. Turn the RT power switch to LOW, and using the voltmeter, measure the voltage between Pin C (ground) and Pins D, E, F, and J. Observe the test set display as the meter red test lead touches each pin. Let us say that all of the voltage checks made on plug P2 were correct. That identifies the MX-6707 as the bad item, and it will be sent to IDS with a DA Form 2407 for repair. Now, let's say that the voltage checks between Pin C and Pins D, E, and F were 0 volts, but a voltage check at Pin J showed 24 VDC. This identifies the MX-6707 as good, but it tells us that either the RT unit or the CX-4722 cable is bad. This means that more voltage checks are needed to find out which is actually bad. (See Figure 115.)

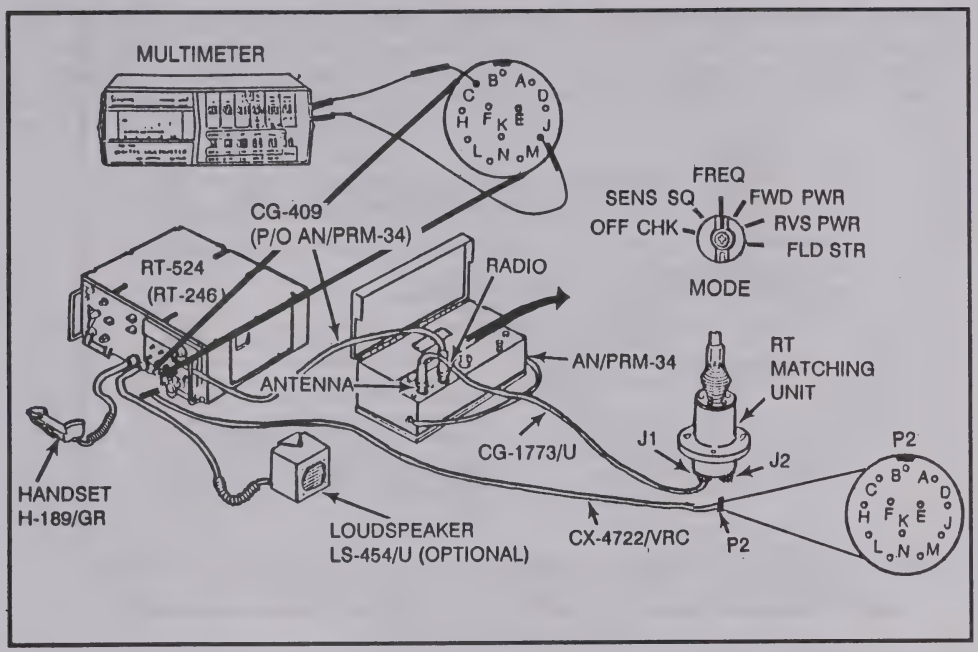

Figure 115. Matching unit control voltage check on Pins J RT ANT CONT jack J353(310).

(c) Again, turn the RT unit POWER switch to OFF, and disconnect the CX-4722 cable from the RT ANT CONT jack. Now, locate Pins C and J on the ANT CONT jack, and make a voltage measurement between these two pins. If 24 volts is obtained at Pin J of the ANT CONT jack, the RT unit is bad and it would be sent to IDS, with a DA Form 2407, for repair. However, if a 0-volt reading is obtained at Pin J of the RT ANT CONT jack, the RT unit is not bad; but it identifies the CX-4722 cable as bad and that the CX-4722 cable contains a short circuit. We know that if a cable can be repaired it should be; therefore, let us find out which circuits are shorted together. (See Figure 116.)

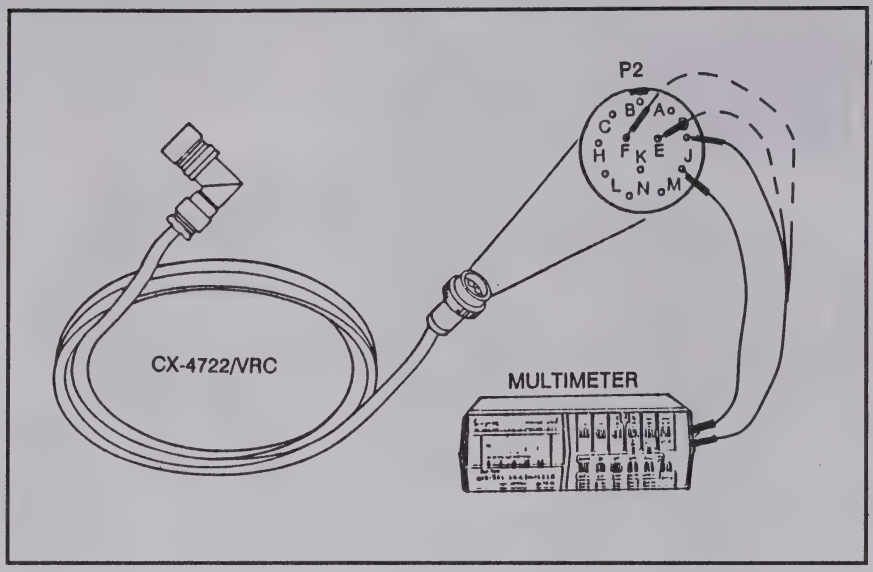

Figure 116. Shorts test between Pin J and Pins D, E, F, of P2 of the CX-4722 cable.

(d) To find out which circuit is shorted to the J circuit in the CX-4722 cable, set up the meter to measure resistance on the 200-ohm range and then locate Pin J of P2 and put the meter black test lead in Pin J. Now, with the meter red test lead, touch Pins D, E, and F one at a time and observe the meter display as each pin is touched. The circuit, D, E, or F, that is shorted to Pin J will cause the meter display to indicate 0 ohms. If the cable can be repaired, repair it and record the repair work done on a DA Form 2404.

g. (Read step 6 of the Appendix, then return to the text.) EPC step 6 checks the RT unit receive signal path squelch sensitivity. If the indications are all normal, step 6 is good and the check of the RT receive signal path has been completed. However, if step 6 is bad, the abnormal indication listed on the DA Form 2404 will be seen. (See Figure 117.)

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38-750; the proponent agency is the Office of the Deputy Chief of Staff for Logistics

1. ORGANIZATION | 2. NOMENCLATURE AND MODEL

3. REGISTRATION/SERIAL/NSN	4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION

7. APPLICABLE REFERENCE

TM NUMBER	TM DATE	TM NUMBER	TM DATE

COLUMN a — Enter TM item number.

COLUMN b — Enter the applicable condition status symbol.

COLUMN c — Enter deficiencies and shortcomings.

COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X"—Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X"—Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed in the manual until corrective action can be accomplished.

HORIZONTAL DASH "(–)"—Indicates that a periodic inspection, component replacement, maintenance operation check, or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)"—Indicates a materiel defect other than a deficiency which must be corrected to increase efficiency or to make the item completely operable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL-Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT-Status symbols will be recorded in red.

SAMPLE

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED

TM ITEM NO. a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
6		CALL LAMP DID NOT LIGHT AND TONE WAS NOT HEARD IN SQUELCH ON POSITIONS.		

DA FORM 1 APR 79 2404 — Replaces edition of 1 Jan 64, which will be used

Figure 117. EPC step 6, possible bad indication.

If EPC step 6 is bad, only the RT unit could be defective, because the squelch circuits are internal to the radio component. If bad, the RT will be sent to intermediate support (IDS) for repairs (accompanied by a DA Form 2407).

PRACTICE EXERCISES:

53. Which EPC step is the first EPC step that checks the receiver-transmitter receive signal path?

    a. step 1
    b. step 2
    c. step 4
    d. step 5

54. If RT audio output is normal, you will hear a loud rushing noise in--

a. the earphone only.
b. the loudspeaker only.
c. the earphone and loudspeaker.
d. none of the above.

55. (See Figure 98.) An abnormal indication of no rushing noise in EPC step 2 could be caused by a defective _____ _____, _____, _____, or _____.

56. (See Figure 99.) Which pins are used to make a circuit disturbance check in the H-140 headset?

a. Pins A and B
b. Pins A and C
c. Pins A and D
d. Pins A and E

57. (See Figure 100.) Which pins in the RT X-MODE jack cap are used for the receive signal path?

a. Pins J and D
b. Pins G and E
c. Pins A and C
d. Pins K and F

58. To protect the mount-to-radio plug and/or jack contacts, you must place the radio POWER switch in which position before removing the radio from its mount?

a. REMOTE
b. HIGH
c. LOW
d. OFF

59. (See Figure 108.) When checking EPC step 5, which components, cables, and accessories are being used?

a. AS-1729, to include MX-6707
b. CG-1773 and RT unit
c. CX-4722
d. all of the above

60. If EPC step 5 is bad and the matching unit MX-6707 is found to be bad, where is it sent for repairs?

    a. organizational maintenance
    b. intermediate direct support
    c. depot
    d. factory

//

ANSWERS:

53. b.
54. c.
55. RT unit, MT-1029, J-3513/U, handset.
56. a.
57. c.
58. d.
59. d.
60. b.

//

h. Now that the RT receive signal path has been checked, let us compare the R-442 receive signal path operation with the RT. A fact that will emerge from the checks on the R-442 receive signal path is that the operation of one radio component receive signal path is identical to all radio components in the AN/VRC-12 series radios. When checking the receiver R-442 using test set AN/PRM-34, you should check the antenna (AB-15) first. (See Figure 118.)

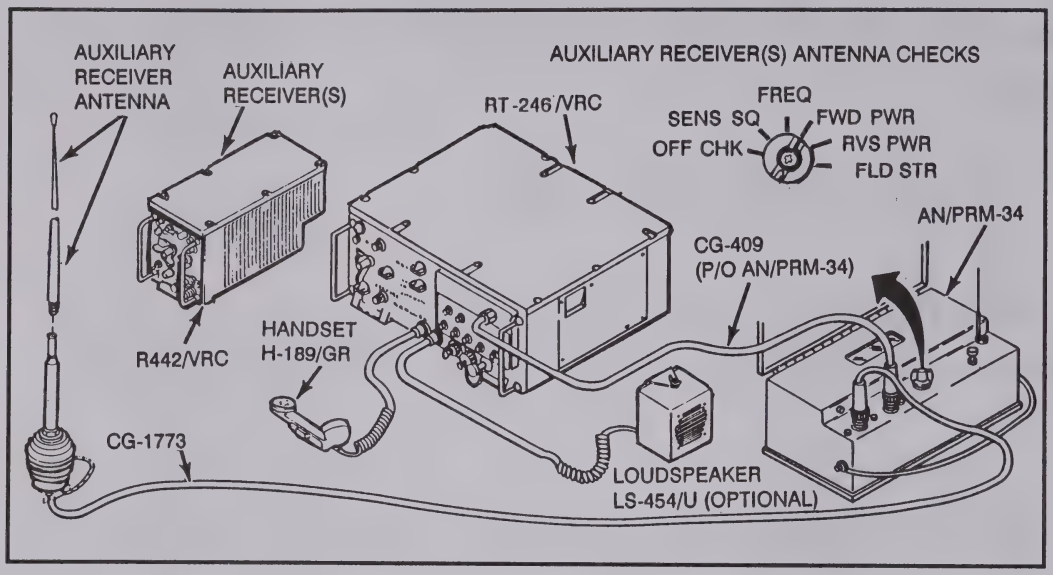

Figure 118. AN/PRM-34 test set cabled to check R-442 antenna (AB-15).

(1) (Read step 19 of the Appendix, and then return to the text.) EPC step 19 checks the receiver R-442 antenna. When checking step 19, after doing all of the listed setups for this step, if all of the indications are normal, you check the next EPC step. However, if step 19 is bad, the abnormal indication listed on the DA Form 2404 in Figure 119 will occur.

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38 750; the proponent agency is the Office of the Deputy Chief of Staff for Logistics

1. ORGANIZATION				2. NOMENCLATURE AND MODEL			
3. REGISTRATION/SERIAL/NSN	4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION	
7. APPLICABLE REFERENCE							
TM NUMBER	TM DATE	TM NUMBER	TM DATE				

COLUMN a — Enter TM item number.
COLUMN b — Enter the applicable condition status symbol.
COLUMN c — Enter deficiencies and shortcomings.
COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.
COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X"—Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X"—Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed in until corrective action can be accomplished.

HORIZONTAL DASH "(–)"—Indicates that a inspection, component replacement, maintenance operation check, or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)"—Indicates a materiel defect other deficiency which must be corrected to inefficiency or to make the item completely ble.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL-Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT-Status symbols will be recorded in red.

SAMPLE

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person (s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10 MAN-HOURS REQUIRED

TM ITEM NO. a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
19		REFLECTED POWER IS MORE THAN 1/3 OF FORWARD POWER.		

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Figure 119. EPC step 19, possible bad indication.

(2) (See Figure 120.) If EPC step 19 checks bad, the possible bad items of equipment are the receiver antenna (AB-15) or the receiver RF cable CG-1773. Make sure that all three of the antenna sections are screwed together tightly, then make sure the bottom section is screwed securely to the AB-15, and repeat EPC step 19. If step 19 now checks good, proceed with the op check. If the step still checks bad, the CG-1773 RF cable must be checked for opens and shorts.

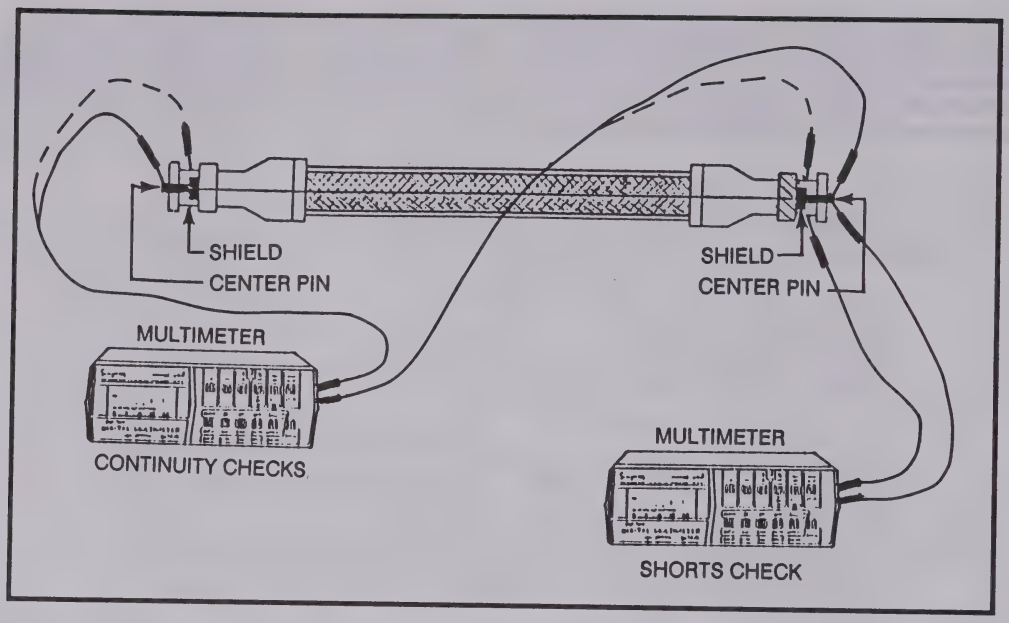

Figure 120. RF cable CG-1773/V--continuity checks and shorts check.

To check the cable for an open circuit, make continuity checks, from the center Pin on one end of the cable, to the center Pin on the other end of the cable, and from the shield on one end of the cable to the shield on the other end of the cable. A good reading for these continuity checks is a reading of 0 ohms. To check the cable for a short, a shorts test will be made at one end of the cable only and from center Pin to shield. A good reading for this shorts check is infinite ohms. A meter reading of infinite ohms for a continuity check, or a 0-ohms reading for a shorts check identifies the cable as bad, and the cable must be repaired or replaced. The repairs done on this cable will be recorded on a DA Form 2404.

ppendix, and then return to the text.) Step 20
If this step is bad, the abnormal indications
gure 121 will occur.

INSPECTION AND MAINTENANCE WORKSHEET

50; the proponent agency is the Office of the Deputy Chief of Staff for Logistics.

	2. NOMENCLATURE AND MODEL				
	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION

APPLICABLE REFERENCE

M DATE	TM NUMBER	TM DATE

on status symbol.

comings.

COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

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t a inspec-
ce operation check,
mplished, or an
l.

DI NAL "(/)"—Indicates a materiel defect other deficiency which must be corrected to in- fficiency or to make the item completely le.

AST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL-Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT-Status symbols will be recorded in red.

SAMPLE

NT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED TIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8b. TIME	9a. SIGNATURE *(Maintenance Supervisor)*	9b. TIME	10. MANHOURS REQUIRED

HORTCOMINGS	CORRECTIVE ACTION	INITIAL WHEN CORRECTED
	d	e
G NOISE		
EARPHONE		
)		
G NOISE		
EARPHONE		
ER		

Replaces edition of 1 Jan 64, which will be used

step 20 possible bad indications.

shing noise in the earphones or the speaker, the
ld possibly be bad (see Figure 122):

42.

8.

J-3514.

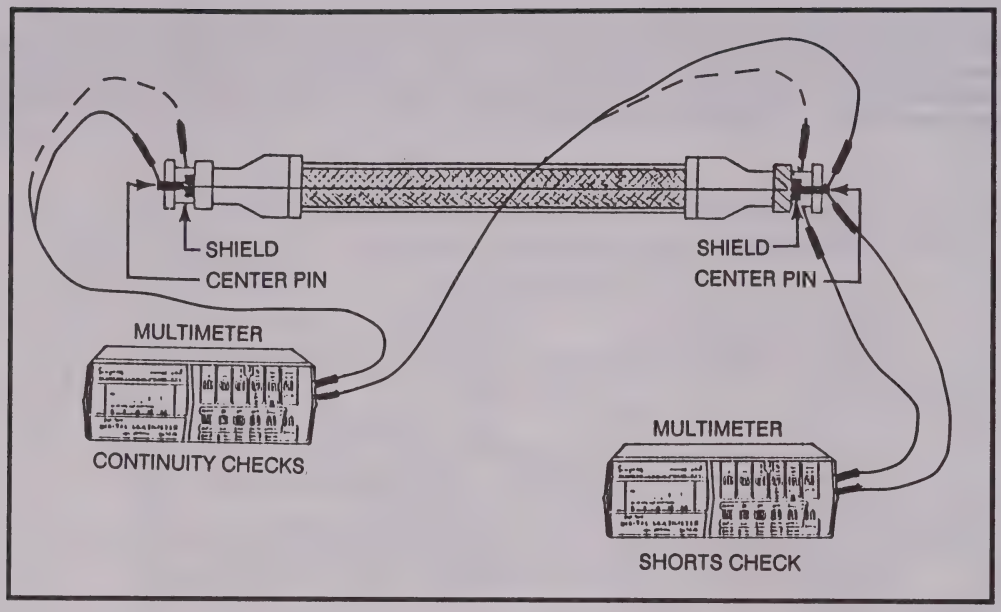


Figure 120. RF cable CG-1773/V--continuity checks and shorts check.

To check the cable for an open circuit, make continuity checks, from the center Pin on one end of the cable, to the center Pin on the other end of the cable, and from the shield on one end of the cable to the shield on the other end of the cable. A good reading for these continuity checks is a reading of 0 ohms. To check the cable for a short, a shorts test will be made at one end of the cable only and from center Pin to shield. A good reading for this shorts check is infinite ohms. A meter reading of infinite ohms for a continuity check, or a 0-ohms reading for a shorts check identifies the cable as bad, and the cable must be repaired or replaced. The repairs done on this cable will be recorded on a DA Form 2404.

i. (Read step 20 of the Appendix, and then return to the text.) Step 20 checks the R-442 audio output. If this step is bad, the abnormal indications listed on the DA Form 2404 in Figure 121 will occur.

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38-750; the proponent agency is the Office of the Deputy Chief of Staff for Logistics

1. ORGANIZATION					2. NOMENCLATURE AND MODEL	
3. REGISTRATION/SERIAL/NSN	4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION

7. APPLICABLE REFERENCE			
TM NUMBER	TM DATE	TM NUMBER	TM DATE

COLUMN a — Enter TM item number.
COLUMN b — Enter the applicable condition status symbol.
COLUMN c — Enter deficiencies and shortcomings.
COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.
COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X"—Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X"—Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed by [illegible] until corrective action can be accomplished.

HORIZONTAL DASH "(–)"—Indicates that a [illegible] inspection, component replacement, maintenance operation check, or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)"—Indicates a materiel defect other than deficiency which must be corrected to improve efficiency or to make the item completely serviceable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL: Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT-Status symbols will be recorded in red.

SAMPLE

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED

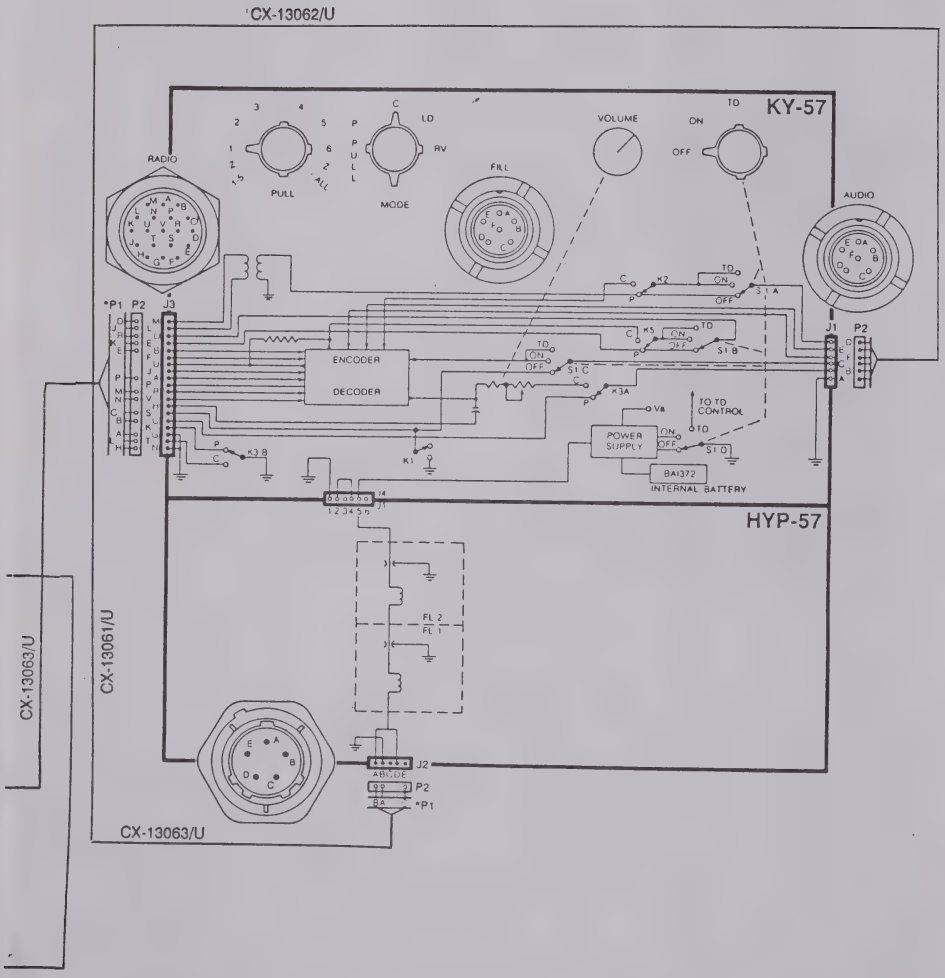
TM ITEM NO. a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
2		NO RUSHING NOISE HEARD IN EARPHONE		
		(OR)		
2		NO RUSHING NOISE HEARD IN EARPHONE OR SPEAKER		

DA FORM 1 APR 79 2404 — Replaces edition of 1 Jan 64 which will be used

Figure 121. EPC step 20 possible bad indications.

(1) If there is no rushing noise in the earphones or the speaker, the following items of equipment could possibly be bad (see Figure 122):

- Receiver R-442.
- Mount MT-1898.
- Junction Box J-3514.



cuits, cabled with VINSON.

A rushing noise is produced inside the radio component when operating voltage is applied to its assemblies, A1000, A2000, A3000, A4000, and A5000. The rushing noise from the A1000, A2000, A3000, and A4000 is sent through the R-442 X-MODE switch through Pin L of the R-442s plug P201. From Pin L of P201, it is applied through Pin L of jack J14 on the MT-1898 mount through the MT-1898 X-MODE IN circuit and is applied to Pin D of jack J12 on the MT-1898. The rushing noise is now applied to Pin D of plug P1 of the J-3514, through the J-3514 to Contact 4 of J-3514 circuit board, then through contacts B3 and B2 of relay K2, back through Contact 2 of the J-3514 circuit board to Pin E of the J-3514 plug P1. From Pin E of P1, the rushing noise is applied to Pin E of jack J12 on the MT-1898, through the MT-1898 X-MODE OUT circuit to Pin E of the MT-1898 jack J14. The rushing noise is now applied to Pin E of the R-442 plug P201 through the R-442 to the input of AF assembly A5000. One of the rushing noise outputs from the A5000 assembly is applied to Pins B of the radio audio jacks, J103 and J104, which is the R-442 unmuted audio output circuit. The other output of the A5000 assembly is sent through the radio components muting relay K5001 and is applied to Pin E of the radio components audio jacks J103 and J104.

(2) The possible bad items of equipment--the R-442, the MT-1898, and the J-3514--must be checked, one at a time, until the actual bad item is identified. The type of tests to use are continuity checks and shorts checks. (See Figure 123.)

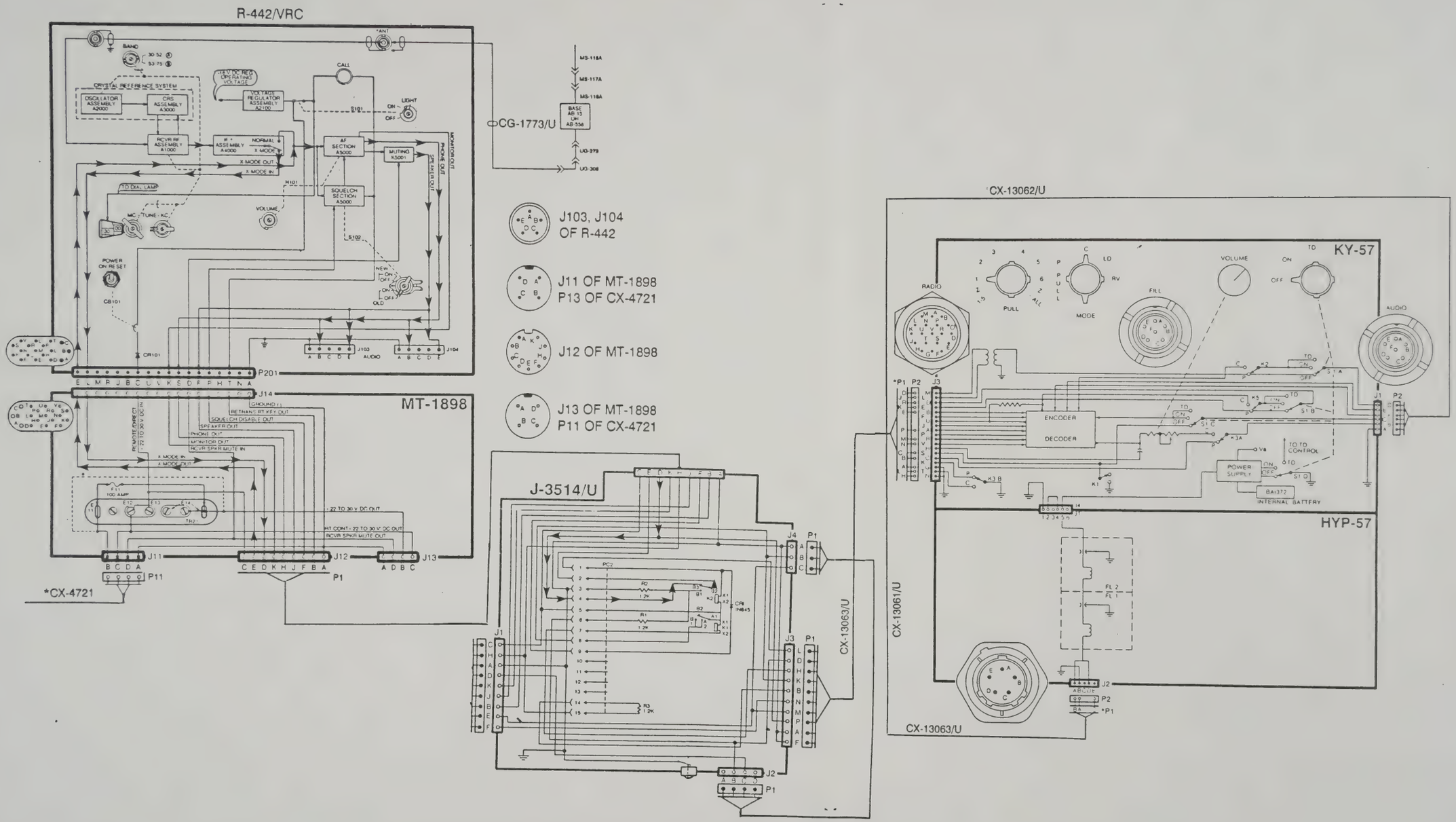


Figure 122. R-442 audio output-phone and speaker circuits, cabled with VINSON.

A rushing noise is produced inside the radio component when operating voltage is applied to its assemblies, A1000, A2000, A3000, A4000, and A5000. The rushing noise from the A1000, A2000, A3000, and A4000 is sent through the R-442 X-MODE switch through Pin L of the R-442s plug P201. From Pin L of P201, it is applied through Pin L of jack J14 on the MT-1898 mount through the MT-1898 X-MODE IN circuit and is applied to Pin D of jack J12 on the MT-1898. The rushing noise is now applied to Pin D of plug P1 of the J-3514, through the J-3514 to Contact 4 of J-3514 circuit board, then through contacts B3 and B2 of relay K2, back through Contact 2 of the J-3514 circuit board to Pin E of the J-3514 plug P1. From Pin E of P1, the rushing noise is applied to Pin E of jack J12 on the MT-1898, through the MT-1898 X-MODE OUT circuit to Pin E of the MT-1898 jack J14. The rushing noise is now applied to Pin E of the R-442 plug P201 through the R-442 to the input of AF assembly A5000. One of the rushing noise outputs from the A5000 assembly is applied to Pins B of the radio audio jacks, J103 and J104, which is the R-442 unmuted audio output circuit. The other output of the A5000 assembly is sent through the radio components muting relay K5001 and is applied to Pin E of the radio components audio jacks J103 and J104.

(2) The possible bad items of equipment--the R-442, the MT-1898, and the J-3514--must be checked, one at a time, until the actual bad item is identified. The type of tests to use are continuity checks and shorts checks. (See Figure 123.)

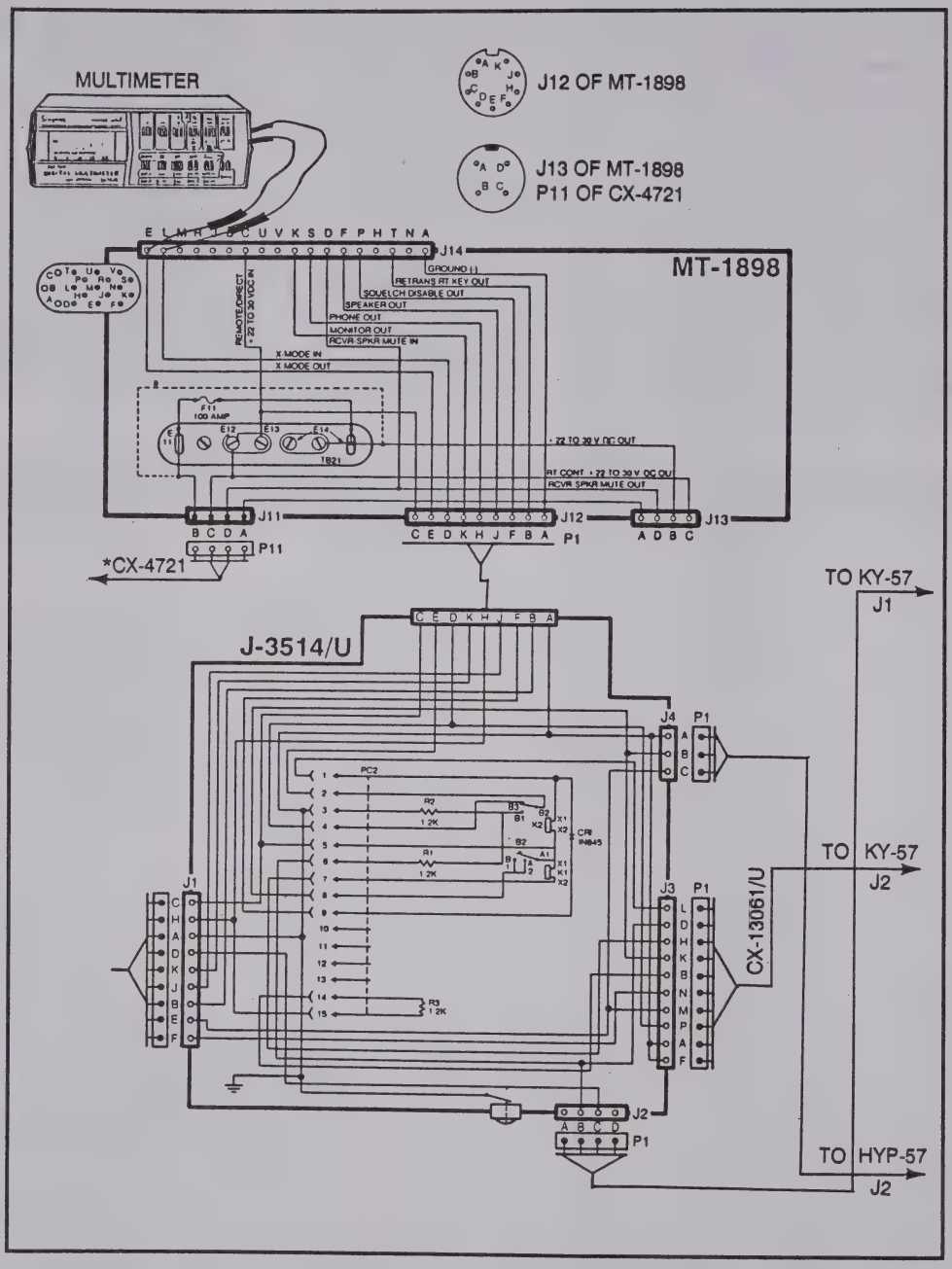


Figure 123. Continuity and shorts checks of MT-1898 and J-3514 audio output circuit.

(a) Set up a multimeter to measure resistance (2K range), and then set the R-442 POWER ON-RESET switch at OFF. Then, remove the R-442 from the MT-1898 mount, and set the radio to the side. Now, locate Pins E, L, and A on the MT-1898 jack J14.

CAUTION

PIN C OF JACK J14 HAS 24 VDC ON IT. DO NOT PLACE A METER TEST LEAD IN THIS PIN WHEN USING THE METER SETUP FOR RESISTANCE MEASUREMENTS.

(b) Now, check the continuity of the system audio output circuit by placing one meter test lead on Pin E of J14 and then place the remaining meter test lead on Pin L of J14 and observe the meter display. If the meter indicated 0 ohms, the E and L circuits are complete, through the MT-1898 and the J-3514, as they should be. This is a good reading. Now, to verify that the audio is not shorted to ground, which would also cause you to have no rushing noise, make a shorts test between Pins E and A and L and A on jack J14. (See Figure 124.)

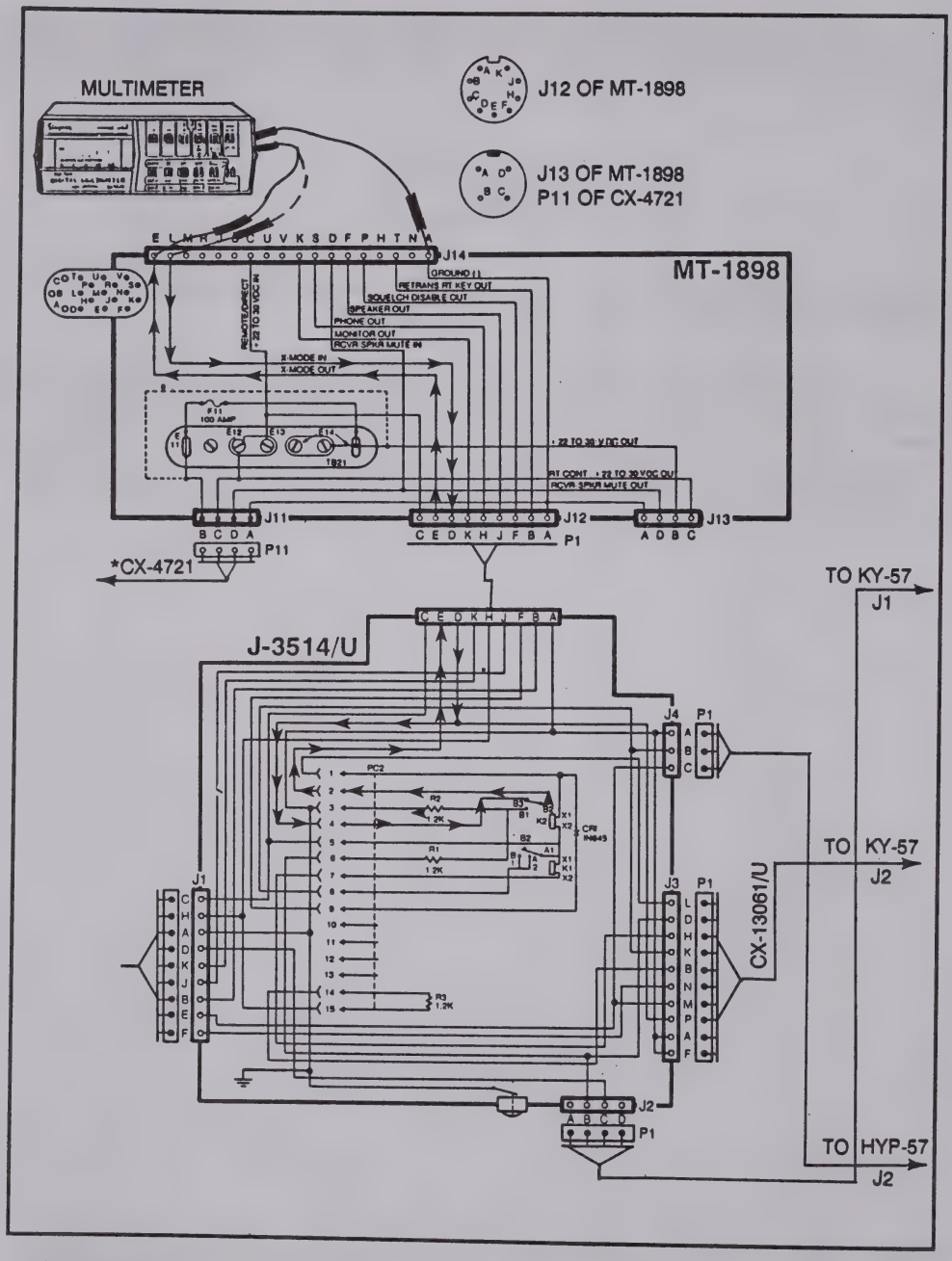


Figure 124. Shorts check of audio output circuit of MT-1898 and J-3514.

(c) If both shorts tests are infinite, the MT-1898 and the J-3514 are good and the R-442 is the defective item of equipment. The R-442, with a completed DA Form 2407, would be sent to IDS for repair. However, if the continuity check between Pins E and L of J14 showed infinite ohms or either one of the shorts checks showed 0 ohms, the R-442 is not the bad item of equipment, but either the MT-1898 or the J-3514 is defective. (See Figure 125.)

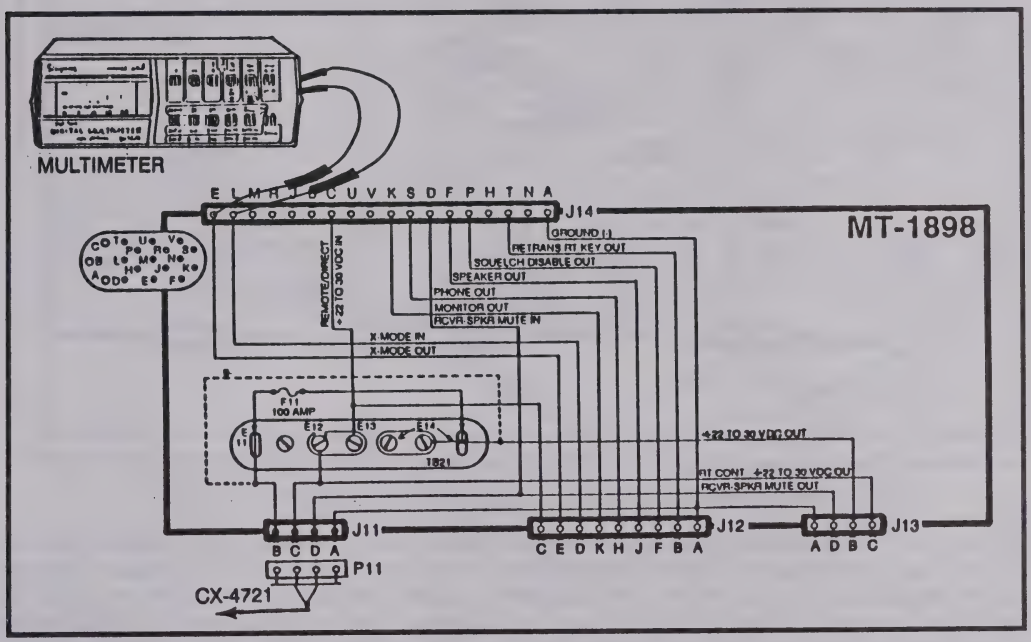


Figure 125. Shorts check of MT-1898 audio output circuit with MT-1898 disassembled and J-3514 disconnected from jack J12.

(d) To identify which is actually bad, the MT-1898 or the J-3514, first disassemble the MT-1898 and disconnect the J-3514 cable from jack J12 of the MT-1898. Now, using the ohmmeter, make a shorts check between Pins E and L of J14 on the MT-1898. If the meter shows 0 ohms, the MT-1898 is bad (shorted). Check the MT-1898 junction box wiring, and remove the short if possible. If it is not possible, send the MT-1898, with a completed DA Form 2407, to IDS for repair. (See Figure 126.)

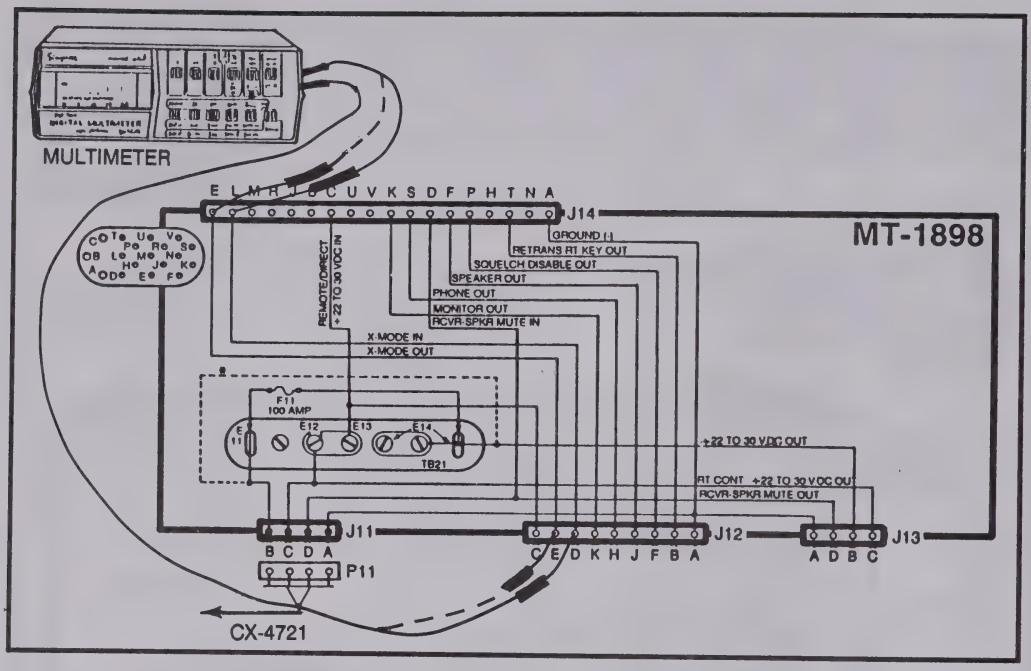


Figure 126. Continuity check of MT-1898 audio output circuit.

(e) However, when making a shorts check between Pins E and L of J14, even though the meter indicated infinite ohms (not shorted), you should verify the fact that these two circuits are complete (not open) from the point of input to the point of output. To do this, using the ohmmeter, make a continuity check from Pin E of J14 to Pin E of J12 and from Pin L of J14 to Pin D of J12. If either of these two checks show infinite ohms on the meter display, the circuit being checked is open. You would repair the open circuit if possible. If it is not possible, the MT-1898 would be sent to IDS for repair. However, if it is determined that the J-3514 is bad, it will be turned in to COMSEC maintenance for repair, accompanied by the completed, appropriate maintenance request forms.

(3) If, when checking EPC step 20, rushing noise is heard in the speaker, but not in the headset, you must check the headset for an open circuit. (See Figure 127.)

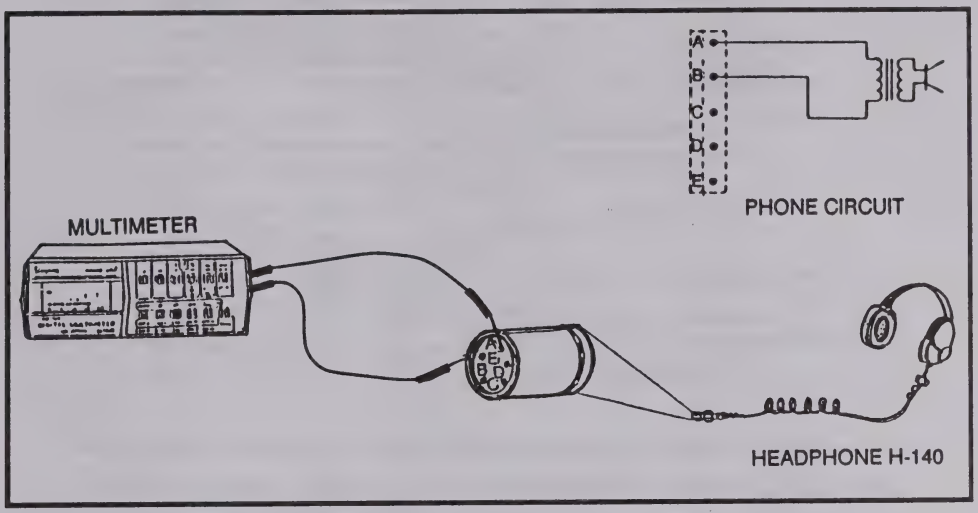


Figure 127. Circuit disturbance check of H-140 phone circuit.

(a) To check the headset audio circuits, place the headset on your head and, using the ohmmeter (2K range), place one meter test lead on Pin A of the audio plug and with the remaining test lead, tap Pin B of the audio plug. If a clicking sound is heard in the headset each time Pin B is tapped, the headset is good and the phone circuit in the R-442 is bad. The R-442 would be sent to IDS for repair. However, if a clicking sound was not heard in the headset, the headset is bad and it would be replaced. (See Figure 128.)

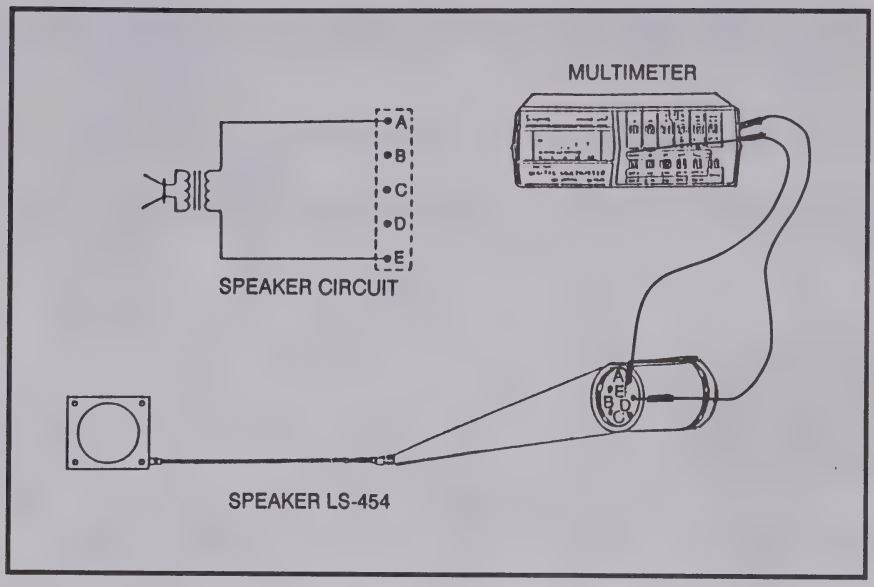


Figure 128. Circuit disturbance check of LS-454 speaker circuit.

(b) If, when checking EPC step 20, rushing noise is heard in the headset, but not in the speaker, you would check the speaker for an open circuit. To check the speaker circuit in the LS-454, set the speaker in front of you and locate Pins A and E on the audio plug. Using the ohmmeter (2K range), place one meter test lead on Pin A of the audio plug and with the remaining meter test lead, tap Pin E on the audio plug. If a clicking sound is heard in the speaker, the speaker is good and the speaker circuit in the R-442 is bad. The R-442 would be sent to IDS for repair. However, if a clicking sound is not heard in the speaker, the speaker is bad and it would be replaced.

j. (Read step 21 of the Appendix, and then return to the text.) Step 21 checks the R-442 squelch control and CALL lamp operation.

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38-750; the proponent agency is the Office of the Deputy Chief of Staff for Logistics

1. ORGANIZATION						2. NOMENCLATURE AND MODEL	
3. REGISTRATION/SERIAL/NSN	4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE		6. TYPE INSPECTION

7. APPLICABLE REFERENCE			
TM NUMBER	TM DATE	TM NUMBER	TM DATE

COLUMN a — Enter TM item number.

COLUMN b — Enter the applicable condition status symbol.

COLUMN c — Enter deficiencies and shortcomings.

COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X"—Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X"—Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed in the TM until corrective action can be accomplished.

HORIZONTAL DASH "(–)"—Indicates that a periodic inspection, component replacement, maintenance operation check, or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)"—Indicates a materiel defect other than a deficiency which must be corrected to increase efficiency or to make the item completely serviceable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL-Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT-Status symbols will be recorded in red.

SAMPLE

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED

TM ITEM NO. a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
21		PUSHING NOISE NOT QUIETED AND CALL LAMP LIGHTS IN SQUELCH ON POSITIONS		

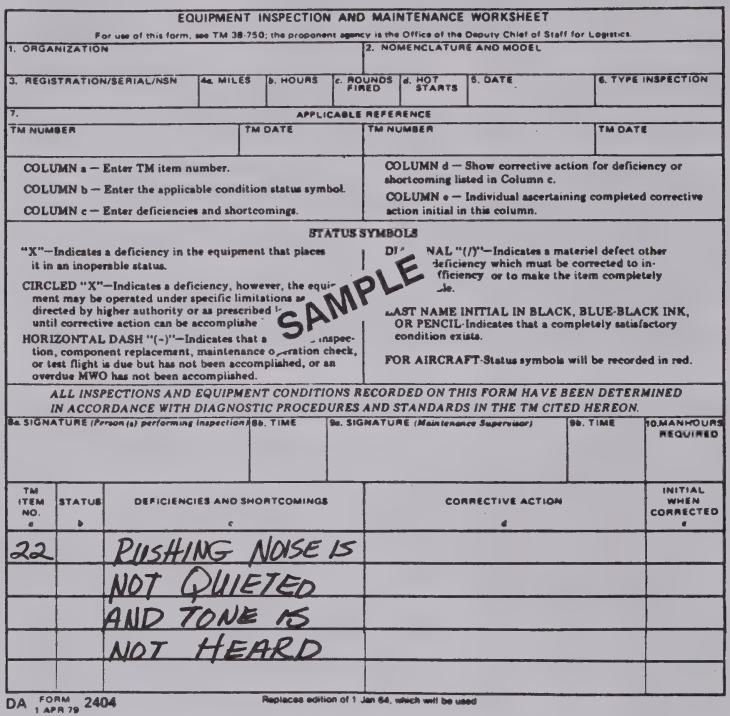
DA FORM 1 APR 78 2404 Replaces edition of 1 Jan 64, which will be used

Figure 129. EPC step 21--possible bad indication.

(1) If step 21 is bad, the abnormal indication listed on the DA Form 2404 shown in Figure 129 will occur.

(2) If this EPC step is bad, only the R-442 could be bad. The R-442 will be sent to IDS for repairs (accompanied by a DA Form 2407).

k. (Read step 22 of the Appendix, and then return to the text.) EPC step 22 checks receive sensitivity (reception) of an R-442. If step 22 is bad, the abnormal indication listed on the DA Form 2404 in Figure 130 would occur. If EPC step 22 is bad, only the R-442 could be bad. It will be sent to IDS for repairs (accompanied by a DA Form 2407).



EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form, see TM 38-750; the proponent agency is the Office of the Deputy Chief of Staff for Logistics.

1. ORGANIZATION		2. NOMENCLATURE AND MODEL					
3. REGISTRATION/SERIAL/NSN	4a. MILES	b. HOURS	c. ROUNDS FIRED	d. HOT STARTS	5. DATE	6. TYPE INSPECTION	
7. APPLICABLE REFERENCE							
TM NUMBER	TM DATE	TM NUMBER	TM DATE				

COLUMN a — Enter TM item number.

COLUMN b — Enter the applicable condition status symbol.

COLUMN c — Enter deficiencies and shortcomings.

COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X"—Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X"—Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed [illegible] until corrective action can be accomplished.

HORIZONTAL DASH "(–)"—Indicates that a [illegible] inspection, component replacement, maintenance operation check, or test flight is due but has not been accomplished, or an overdue MWO has not been accomplished.

DIAGONAL "(/)"—Indicates a materiel defect other than deficiency which must be corrected to increase efficiency or to make the item completely operable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL-Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT-Status symbols will be recorded in red.

SAMPLE

ALL INSPECTIONS AND EQUIPMENT CONDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOSTIC PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED

TM ITEM NO. a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
22		PUSHING NOISE IS NOT QUIETED AND TONE IS NOT HEARD		

DA FORM 1 APR 79 2404 Replaces edition of 1 Jan 64, which will be used

Figure 130. EPC step 22--possible bad indication.

PRACTICE EXERCISES:

61. (See Figure 118.) When EPC step 19 is being checked, you connect which cable between the base of the auxiliary receiver antenna and the ANT jack on the AN/PRM-34?

    a. CG-409
    b. CG-1773
    c. CX-4720
    d. CX-4721

62. (See Figure 120.) When the RF cable CG-1773/U is being checked for an open circuit, regardless of which circuit you are checking, what is a good ohms reading?

    a. 0 ohms
    b. 10 ohms
    c. 25 ohms
    d. 50 ohms

63. (See Figure 122.) When checking EPC step 20, you obtain an abnormal indication of <u>no rushing noise</u>. Which items of equipment could be bad?

    a. AB-15 and CG-1773/U
    b. R-442 and CX-4721
    c. R-442, MT-1898, and J-3514.
    d. MT-1898, CX-4721, and MT-1029

64. (See Figure 129.) What item of equipment, if defective, will cause EPC step 21 to be bad?

    a. AB-15 antenna
    b. CG-1773/U RF cable
    c. R-442 receiver
    d. CX-4721 cable

//

ANSWERS:

61. b.
62. a.
63. c.
64. c.

//

17. SUMMARY. In this learning event, you learned which components, cables, and accessories are used when evaluating an AN/VRC-12 series radio set with COMSEC equipment receive signal paths, the RT unit, and an auxiliary receiver secured with COMSEC equipment. You were shown the circuit paths through all of the components, cables, and accessories; how to identify an abnormal indication; and how to check the different circuits to find an open or a shorted circuit. This learning event also taught you the maintenance responsibilities for any bad radio component, mount, COMSEC equipment, cable, or accessory. If you will apply all of the skills and knowledge learned in this learning event, you will be able to maintain the communications equipment of your unit in a constant state of readiness.

EXAMINATION

SYSTEM TROUBLESHOOT TO CORRECTIVE ACTION AN/VRC-12 SERIES RADIO SET WITH COMSEC EQUIPMENT, PART I

This examination consists of 50 questions. Answer all questions on the enclosed ACCP Examination Response Sheet (TSC Form 59). Individual work is mandatory on this examination. After completing the examination, place the answer sheet in the self-addressed envelope provided and mail it to the Institute for Professional Development (IPD) for grading. IPD will send you a copy of your grade for this examination.

1. Source voltage for AN/VRC-12 series radios is provided by two--

   a. 12-volt batteries.
   b. 18-volt batteries.
   c. 24-volt batteries.
   d. 36-volt batteries.

2. The operating voltage for AN/VRC-12 series radios is applied to the MT-1209 mount from the vehicle batteries through which cable?

   a. CG-1773
   b. CX-4720
   c. CX-4721
   d. CX-4722

3. MT-1029 mounts manufactured after 1972 do not have--

   a. fuse F11 and E24.
   b. E21 and E24.
   c. fuse F11 and E21.
   d. fuse F11 and E22.

4. For the operating voltage to be applied to Pin J of J24 on the MT-1029 mount, the link on terminal board TB-21 must be positioned between--

   a. E21 and E23.
   b. E22 and E23.
   c. E22 and E24.
   d. E23 and E24.

5. Which pin on jacks J21, J22, J23, and J24 on the MT-1209 mount is the negative potential of the source voltage?

   a. Pin D
   b. Pin C
   c. Pin B
   d. Pin A

6. Plug P401 on the back of the "A" RT connects with which jack on the MT-1029 mount?

   a. J24
   b. J23
   c. J22
   d. J21

7. The positive potential of the source voltage is appilied to which pin of the MT-1029 mount on the jack J21?

   a. Pin A
   b. Pin B
   c. Pin C
   d. Pin D

8. Which contact of relay K404 provides relay K404 its ground path?

   a. Contact 2
   b. Contact 3
   c. Contact 5
   d. Contact 7

9. Which radio components make up an AN/VRC-47 radio set?

   a. RT-246 and R-442
   b. RT-524 and RT-246
   c. RT-524 and R-442
   d. RT-524 and two R-442

10. Which cable is used to apply operating voltage to the R-442 mount MT-1898?

    a. CG-1773
    b. CX-4720
    c. CX-4721
    d. CX-4722

11. For the receiver R-442 to work in the DIRECT power mode operation, the link in the MT-1898 mount must be positioned between which two contacts in the junction box?

a. E11 and E12
b. E13 and E14
c. E14 and E12
d. E13 and E11

12. For the receiver R-442 to work in the REMOTE power mode operation, the link in the MT-1898 junction box must be positioned between which two contacts on the mount circuit board?

a. E11 and E12
b. E11 and E14
c. E12 and E13
d. E12 and E14

13. Which EPC steps of the equipment performance checklist, if bad, would identify an RT input power problem?

a. 1, 2, and 4
b. 2, 4, and 5
c. 1, 2, and 3
d. 1, 3, and 4

14. When checking for correct output voltage on jack J24 of the MT-1029 mount, you would measure between which pins?

a. A to C and A to B
b. A to D and A to J
c. A to B and A to J
d. A to B and B to J

15. To check for correct voltage at plug P21 of the CX-4720 power cable, you would measure between which two pins?

a. A and B
b. A and C
c. C and D
d. B and C

16. Which cable is used to connect the C-2742 remote control box to an RT-246?

a. CX-4720
b. CX-4722
c. CX-4723
d. CX-7059

17. If EPC step 11 is bad, you would place a jumper between which pins of plug P71 of the CX-7059 cable?

a. A to B
b. A to P
c. A to U
d. A to R

18. If EPC step 11 is bad, you would place a jumper between which pins of jack J306 on the RT?

a. A to N
b. A to S
c. R to P
d. S to P

19. Which cable is used to apply antenna control voltage from the antenna control jack J353 on the RT unit to jack J2 on the matching unit?

a. CX-4722
b. CX-4721
c. CX-4720
d. CG-1773

20. How many tuned circuits are there in the matching unit MX-6707?

a. 3
b. 7
c. 10
d. 12

21. Which pin of jack J353 on the RT unit provides ground for the MX-6707 matching unit?

a. K
b. M
c. D
d. C

22. What type of circuit defect will cause something <u>not</u> to happen when it is supposed to happen?

a. open
b. short
c. reversal

23. Which EPC step is the first step used to check matching unit control?

a. 2
b. 3
c. 4
d. 11

24. What type of measurement is made to identify the bad item of equipment that is causing a matching unit control problem?

a. ohms
b. current
c. DC voltage
d. AC voltage

25. What is the first thing you do if continuous switching occurs?

a. Turn the RT POWER switch off.
b. Disconnect the CX-4722 from the MX-6707.
c. Remove the RT from its mount.
d. Disconnect the CX-4720 from the vehicle batteries.

26. Which switch on the RT unit is used to check EPC step 3?

a. speaker switch
b. SQUELCH switch
c. light switch
d. BAND switch

27. Which mount is used to apply operating voltage to the auxiliary receiver R-442?

a. MT-2060
b. MT-1989
c. MT-1898
d. MT-1029

28. The AN/VRC-12 series radio sets will receive a frequency of how many channels?

a. 460
b. 520
c. 730
d. 920

29. Which control on the AN/VRC-12 series radio controls the audio signal amplification and audio level?

a. light switch
b. speaker switch
c. MC-TUNE-KC controls
d. volume control

30. The phone-out audio signal of an RT unit is taken from which pin of jack J22 on the MT-1029 mount?

a. Pin F
b. Pin D
c. Pin H
d. Pin T

31. The speaker-out audio signal of an RT unit is taken from which pin of jack J22 on the MT-1029 mount?

    a. Pin B
    b. Pin E
    c. Pin G
    d. Pin J

32. To receive a distant station when you operate the radio in SQUELCH NEW ON, the distant station must modulate the transmitted RF signal with--

    a. 50-Hz tone.
    b. 60-Hz tone.
    c. 150-Hz tone.
    d. 159-Hz tone.

33. The first EPC step that is used to check the RT receive signal path is--

    a. step 1.
    b. step 2.
    c. step 3.
    d. step 11.

34. What kind of test is used to check the H-140 headset when there is no rushing noise in EPC step 2?

    a. circuit disturbance
    b. voltage
    c. resistance
    d. current

35. Which circuit in the X-MODE plug is used when checking EPC step 2?

    a. Pins K to F
    b. Pins D to J
    c. Pins C to A
    d. Pins G to E

36. Which item of equipment is defective if EPC step 4 is bad?

    a. M-80
    b. RT unit
    c. MT-1898
    d. AS-1729

37. When checking EPC step 6 using test set AN/PRM-34, you must set the test set mode switch at which position?

    a. OFF CHK
    b. FWD PWR
    c. FREQ
    d. SEN. SQ.

38. The audio output (rushing noise) used to check the auxiliary receiver is produced by which item of equipment?

a. R-442
b. RT unit
c. MX-6707
d. AB-15

39. R-442 squelch control and call light check are out or abnormal. Which item of equipment would be defective?

a. RT unit
b. R-442
c. MT-1029
d. MX-6707

40. Which cable applies voltage to Pin A of the HYP-57 jack J2?

a. CX-13064/U
b. CX-13063/U
c. CX-13062/U
d. CX-13061/U

41. Operating voltage for the TSEC/KY-57 is applied to which pin on the KY-57 jack J4 from the HYP-57 jack J1?

a. 1
b. 3
c. 5
d. 6

42. Which cable is used to apply voltage to Pin N of the radio jack on the TSEC/KY-57?

a. CX-13061/U
b. CX-13062/U
c. CX-13063/U
d. CX-13064/U

43. The received audio signal, plaintext, is applied to which pins of the KY-57 RAD jack?

a. A and T
b. T and C
c. A and C
d. B and A

44. Which relay is between Pin C of the KY-57 jack J3 and Pin B of the KY-57 AUDIO jack J1 in the plaintext audio circuit?

a. K1
b. K3A
c. K3B
d. K5

45. Which jack on the C-2742 control box provides a communication to the RT-246?

a. J71
b. J72
c. J701
d. J702

APPENDIX

OPERATIONAL CHECK FOR WHEELED VEHICULAR MOUNTED RADIO SYSTEMS AN/VRC-48, AN/VRC-47, AN/VRC-46, AN/VRC-44, AN/VRC-43, AND AN/VRC-12 (SECURE AND WITHOUT INTERCOM)

PART ONE

INTRODUCTION

A-1. OPERATIONAL CHECK.

a. This op check provides a step-by-step procedure for evaluating six of eight VINSON-secured AN/VRC-12 series radio systems installed in military wheeled vehicles. It is to be used to evaluate the operation of radio systems AN/VRC-48, -47, -46, -44, -43, and -12 with COMSEC equipment. It does not contain the procedures required to evaluate the retransmissions features of the AN/VRC-45 and -49 radio systems. It specifies the procedures to be used to evaluate the operational condition of the radio system.

NOTE: To ensure valid evaluation results for the components of the radio system being checked, the op check must be followed exactly as written.

b. The op check first lists preparatory actions that, when done, established a starting condition for the equipment performance checklist that follows. The equipment performance checklist portion is divided into blocks (A, B, C, and so on), and each block contains op check steps that, when done, test a specific circuit or a set of closely related circuits within a major component or within two or more components connected and working together. Overall, and within each block, the op check steps are numerically sequenced (1, 2, 3, and so on), and these step numbers should be referenced when completing columns a and c of a reporting work sheet, DA Form 2404. Each step is subtitled according to the specific function(s) being checked, and each column lists the actions to be done and the expected normal indications. When normal indications are observed for a specific step, proceed to the next step or follow the how-to-proceed instructions below that step. When normal indications are observed for all steps within a block, follow the how-to-proceed instructions at the end of that block. When abnormal indications are observed for a specific step, that step may identify the faulty item of equipment.

NOTE: Throughout this op check are cautions, warnings, and setups that must be observed or done for equipment and personal safety, as well as an accurate evaluation of all the radio system functions.

A-2. INTERVALS.

As a minimum, the op check is done as part of the scheduled preventive maintenance checks and services (PMCS) for the vehicle radio system. At the discretion of the communications electronics (C-E) equipment maintenance supervisor, the op check could be done more often than the scheduled PMCS. After each repair of an item of equipment, the portion of the op check that applies to that item of equipment should be done again to ensure that the malfunction has been corrected and that no other malfunctions exist.

PART TWO

PREPARATORY

A-3. INITIAL ADJUSTMENTS. The first preparatory action in logical sequence for checking the operation of a radio system is making initial adjustments. This preparatory action is done before application of power to prevent personal injury and possible damage to the equipment.

WARNING

DO NOT BE MISLED BY THE TERMS "LOW VOLTAGE" AND "LOW POTENTIAL." VOLTAGE/ POTENTIAL USED IN THE OPERATION OF THESE RADIO SYSTEMS CAN CAUSE DEATH UNDER CERTAIN CONDITIONS.

a. To safeguard against electrical shock, remove or tape all exposed metal objects (for example, rings, watches, medallions, and ID tags).

b. Before installing or removing components of a radio system, turn all power switches to OFF.

CAUTION

DO NOT START VEHICLE WITH RADIO SYSTEM TURNED ON.

A-4. INSTALLATION CHECKS. The installation of major components is also a preparatory action. Here you are to install major component on their mounts and ensure proper cabling and connection of components. Refer to the appropriate TM 11-2300, (0) TM 11-5810-256-op-3, (0) TM 5810-312-12-2, TM 11-5820-401-20-1, and DA Pam 738-750 to verify the installation of the radio system.

A-5. PRESET CONTROLS. To establish a logical starting point for the evaluation procedure, the controls of the components of the radio system must be preset according to the following preparatory actions.

a. For receiver-transmitters, RT-524 AND RT-246--

(1) Turn BAND switch to 30-52 Ⓐ.

(2) Turn LIGHT switch to ON.

(3) Turn SPEAKER switch to ON (RT-524 only).

(4) Tune MC-TUNE-KC controls for 50.00 MHz.

(5) Turn SQUELCH switch to OLD OFF.

(6) Turn VOLUME control fully counterclockwise.

NOTE: Objectionable interference may result when RT is tuned to 33.90, 45.20, 56.50, and 67.80 MHz. Avoid tuning RT to these frequencies.

b. For RECEIVER R-442 (when included)--

(1) Turn BAND switch to 30-52 Ⓐ.

(2) Turn LIGHT switch to ON.

(3) Tune MC-TUNE-KC controls for 50.00 MHz.

(4) Turn VOLUME control fully counterclockwise.

(5) Turn SQUELCH switch to OLD OFF.

c. For remote box C-2742 (when included), disconnect CX-7059 cable from the RT-246 remote jack.

d. VINSON TSEC/KY-57--

NOTE: The MODE and FILL switches use a locking device. (Pull out the control knob to rotate).

(1) Turn MODE switch to CIPHER (C).

(2) Turn FILL switch to position 1.

(3) Turn POWER/TIME DELAY switch to OFF.

(4) Turn VOLUME control fully clockwise.

A-6. VERIFY OPERATION OF TEST SET AN/PRM-34.

a. The AN/PRM-34 is a self-contained test set (TS-3951) that is used to check specific functions of the radio system.

b. The test set has a self-check built-in-test (BIT) feature that is used to verify its operational condition. Before cabling the test set to the radio system, do the built-in-test.

CAUTION

TO AVOID POSSIBLE DAMAGE TO THE TEST SET, MAKE SURE THAT IT IS NOT CONNECTED TO THE RADIO SYSTEM WHEN DOING ITS SELF-CHECK.

(1) Turn MODE switch to OFF/CHECK.

(2) Press down PUSH TO TEST switch. The MHz lamp should light and the display should be 01.000 or 1.000 to indicate the test set is operational.

(3) Release PUSH-TO-TEST switch.

A-7. CABLING THE TEST SET AN/PRM-34.

a. For RT-524 or RT-246 (RT and RT antenna checks), see Figure A-1.

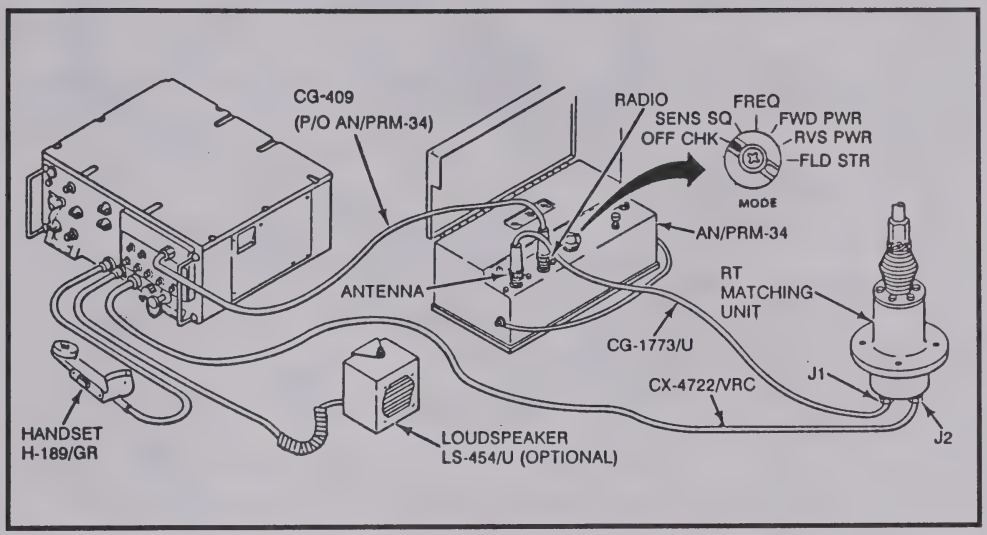


Figure A-1.

b. For R-442 receiver checks, see Figure A-2.

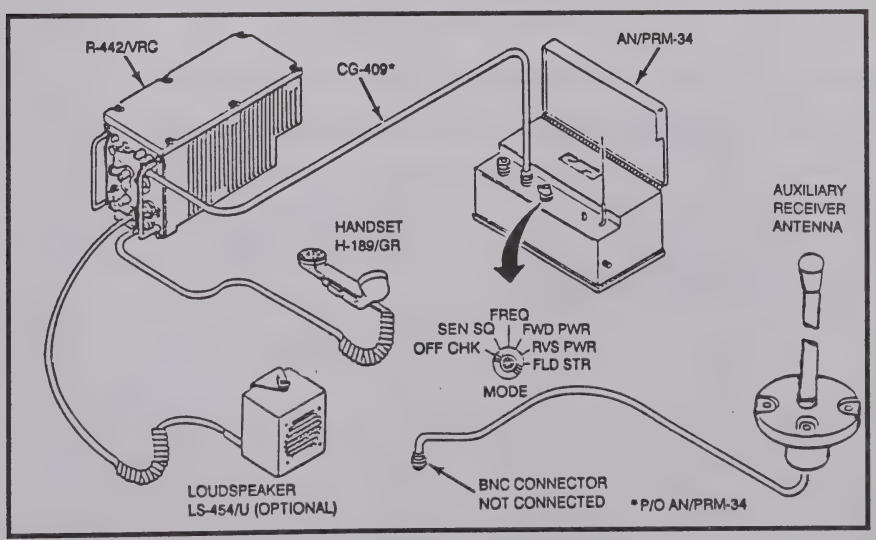


Figure A-2.

c. For R-442 receiver(s) antenna check, see Figure A-3.

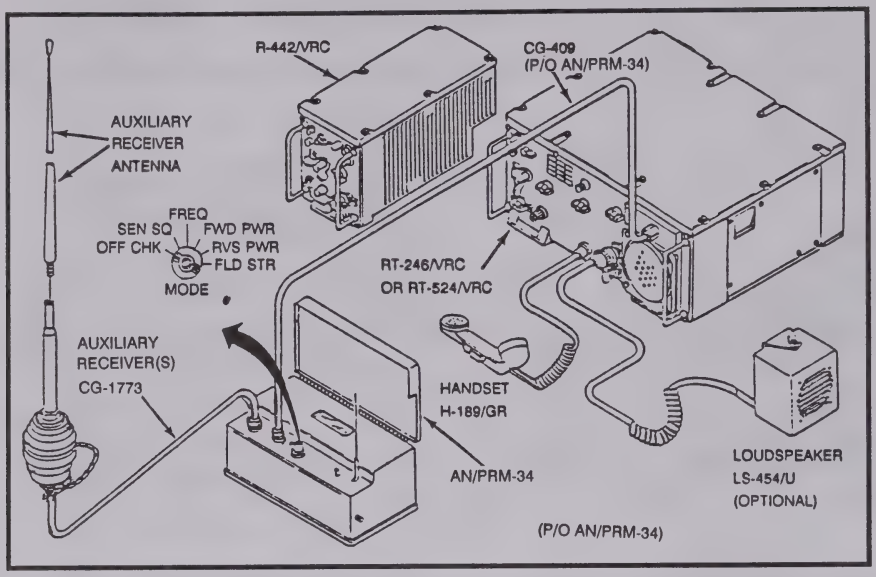


Figure A-3.

PART THREE

EQUIPMENT PERFORMANCE CHECKLIST

A. RT INPUT POWER INITIAL RECEIVE, AND INITIAL MATCHING UNIT (MX) CONTROL CHECKS

Do these checks for either RT-246 or RT-524.

Step 1 INPUT POWER

NOTE

For this check, if matching unit was not initially preset, matching unit switching sound may be heard.

Turn RT POWER switch to LOW.	RT dial lamp lights. If RT Keys (relays click and blower runs), turn RT POWER switch OFF.

Direction: Allow 2-minute warmup.

Step 2 AUDIO OUTPUT

Setup:

1. Disconnect antenna cable CG-1773 from AN/PRM-34 ANT jack.

CAUTION

Do not key an RT when its antenna cable (CG-1773) is disconnected.

2. Appropriate audio accessory should be connected to audio jack of J-3513.

Turn RT VOLUME control fully clockwise (CW), then counter-clockwise (CCW) to midpoint.	In earphone and speaker: rushing noise loudness increases. At full volume, rushing noise is loud. As VOLUME control is turned CCW, rushing noise loudness decreases.

Step 3	INITIAL MATCHING UNIT (MX) CONTROL	
	Turn RT BAND switch to other setting. Then return to original setting.	Switching sound is heard at MATCHING UNIT.
HOW TO PROCEED. Go to block B.		
B. RT RECEIVER AND COMPLETE MX CONTROL CHECKS Do these checks for either RT-246 or RT-524.		
Step 4	SQUELCH CONTROL AND CALL LAMP	
	Rotate RT SQUELCH switch through all four positions	a. OFF positions: A loud rushing noise is heard. b. ON positions: Rushing noise is quieted (eliminated). c. CALL lamp: Remains OFF for all positions. If indications are not correct, RT being checked is defective.
Step 5	RECEIVER SENSITIVITY (RECEPTION) AND COMPLETE MX CONTROL	
	Setup: Turn AN/PRM-34 MODE switch to SEN. SQ. Direction: For the RT being checked, starting with 50.00 MHz, do the substeps (a through d) for each frequency listed below. Frequency setting: 1. 50.00, 2. 45.00, 3. 40.00, 4. 35.00, 5. 30.00 (change BAND switch setting) 6. 55.00, 7. 60.00, 8. 65.00, 9. 70.00 and 10. 75.00.	

Step 5 (Cont)	a. As RT frequency is changed, listen for matching unit switching.	a. MX switching sound is heard when RT MC setting is changed by more than 4 MHz.
	b. Turn RT SQUELCH switch to OLD OFF; then press down and release AN/PRM-34 PUSH TO TEST several times.	b. When AN/PRM-34 PUSH TO TEST is pressed, rushing noise is quieted and a tone is heard at audio accessory. When AN/PRM-34 PUSH TO TEST is released, rushing noise is heard at audio accessory. If indications are incorrect, RT being checked is defective.
	c. Turn RT SQUELCH switch to NEW OFF; then press down and release AN/PRM-34 PUSH TO TEST several times.	c. Indication is the same as substep b.
	d. One at a time, tune RT (in 5-MHz steps) to other nine frequency settings listed. At each setting, repeat substeps a, b, and c.	d. For each frequency setting, indications are the same as in substeps a and b.
Step 6	SQUELCH SENSITIVITY	
	Setup: 1. Tune RT being checked to 75.00 MHz. 2. AN/PRM-34 MODE switch should be at SENS SQ.	
	a. Turn RT SQUELCH switch to NEW ON; then press down and release AN/PRM-34 PUSH TO TEST several times.	a. When AN/PRM-34 PUSH TO TEST is pressed, CALL lamp lights and a tone is heard. When AN/PRM-34 PUSH TO TEST is released, CALL lamp goes off and a very short burst of rushing noise is heard. If indications are incorrect, RT being checked is defective.
	b. Turn RT SQUELCH switch to OLD ON; then press down again and release the AN/PRM-34 PUSH TO TEST several times.	b. Indication is the same as substep a.
HOW TO PROCEED. Go to Block C.		

C. RT KEYING AND MUTING CHECKS

Do these checks for either RT 246 or RT 524.

Step 7 KEYING

Setup for RT being checked:
1. Turn SQUELCH switch to OLD OFF.
2. Reconnect Antenna Cable CG-1773 to AN/PRM-34 ANT jack.
3. RT POWER switch should be set at LOW.

CAUTION

For this check, do not key RT when antenna is disconnected. When keyed, if blower does not run, do not keep RT keyed for more than 3 seconds.

Key RT. Press and release RT PTT switch several times. (Unkey RT before going on.)	When PTT is pressed, RT relays click, blower motor runs; and rushing noise is drastically reduced. When PTT is released, relays click, blower motor stops running.

Step 8 MUTING

With RT speaker on (VOLUME at midpoint) again key RT. (Unkey RT before going on.)	With mike at about 10 inches from speaker, there is no audio feedback (squeal). If feedback occurs, RT being checked is defective.

HOW TO PROCEED. When RT being checked is an:
RT-246, go to block D.
RT-524, go to block F.

D. RT-246 SERVO TUNE (AUTOMATIC TUNING) CHECK

Do these checks for RT-246s

Step 9 AUTOMATIC TUNE

Setup for RT being checked:
Turn BAND switch to AUTO.

NOTE

Instructions for presetting RT-246 push buttons are on closed side of the push button hinged cover.

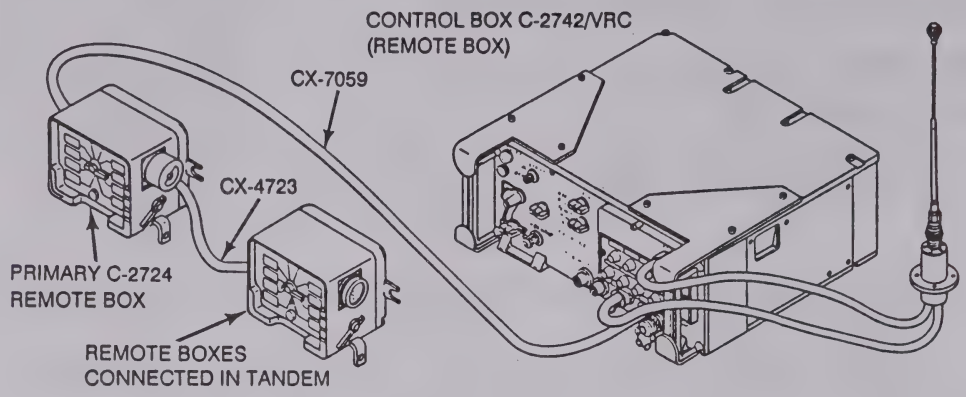
Refer to sample DA Form 2404 of block F (page A-14) for 10 frequencies to be reset.

a. Using the 10 frequencies given, preset frequency 1 on push button 1, frequency 2 on push button 2, etc., until until all ten are preset.	a. The preset frequency appears in RT dial-frequency window as presetting is accomplished MX switching sound is heard.
b. In descending order, press each bush button, but allow each tuning cycle to complete before pressing another push button.	b. RT MC-TUNE-KC controls and BAND switch (as appropriate) change to preset frequency. MX switching sound is heard. If RT fails to tune, RT being checked is defective.

HOW TO PROCEED. When RT-246 being check has:
C-2742s, go to block E.
No C-2742s, go to block F.

E. RT-246/REMOTE BOX, C-2742 INTERFACE CHECKS

Do these checks for RT-246s that have C-2742s.



When two C-2742 remote boxes are in tandem, first check the box directly connected to the RT (primary C-2742).

Step 10	RT-246 REMOTE INPUT POWER CONTROL	
	Setup: For RT-246 being checked: 1. Press in RT-246 push button 1 (allow tuning cycle to complete). 2. Turn RT POWER switch to OFF. 3. Reconnect CX-7059 cable to appropriate RT REMOTE jack. 4. Unlock all C-2742 knob stops. 5. Turn all C-2742 CHAN SEL switches to channel 1 (lower left, write in space). 6. All C-2742 PWR SW (power switches) should be at OFF. 7. If two C-2742s are in tandem, disconnect CX-4723 from primary C-2742 J72 jack.	
	a. Turn RT POWER switch to REMOTE.	a. Rt dial lamp remains off.
	b. Turn C-2742 PWR SW to LO; then press back and release C-2742 SW (toggle switch).	b. RT dial lamp and C-2742 control lamps light. (C-2742 lamp might come on without pressing SW.)
Step 11	R-246 HIGH/LOW TRANSMIT RF POWER CONTROL	
	Turn C-2742 PWR SW to HI; then to LO several times.	RT high/low power relay clicks each time C-2742 PWR SW is changed.

Step 12	RT-246 REMOTE FREQUENCY SELECTION	
	In turn, but allowing each tuning cycle to complete, turn C-2742 CHAN SEL switch to each of its 10 positions.	RT MC-TUNE-KC controls and BAND switch (as appropriate) change according to the 10 RT-246 preset frequencies. MX switching occurs.
	Direction: When C-2742 are in tandem, reconnect CX-4723 to primary C-2742 (J72). Repeat steps 10b, 11, and 12 (above) for the second C-2742. (The Primary C-2742 PWR SW must remain at LO or HI.) Upon completion, go to step 13.	

Step 13	RT-246 REMOTE INPUT POWER CONTROL SHUTDOWN	
	a. Turn primary C-2742 PWR SW to OFF.	a. RT stops operating
	b. Turn RT POWER switch to LOW.	b. RT DIAL lamp lights. If lamp fails to light, RT being checked is defective.

HOW TO PROCEED. Go to block F.

F. RT TRANSMITTER RF POWER LEVELS, ANTENNA, FREQUENCY ACCURACY CHECKS

Do this check for either RT-246 or RT-524.

CAUTION

ENSURE THAT ALL ANTENNA COMPONENTS AND CABLES ARE CONNECTED TO THE APPROPRIATE RT.

NOTE: During the checks of block F, specific RT data must be recorded. These data are in addition to other maintenance actions recorded on the reporting DA Form 2404. Refer to the illustration on page A-16 for format of this additional work sheet.

Step 14 HIGH-LEVEL RF TRANSMIT POWER, AND FREQUENCY ACCURACY

Setup:
1. Prepare a work sheet (DA Form 2404). See illustration on page A-14.
2. Turn POWER switch of RT being checked to HIGH.

NOTE: To obtain a valid check, the vehicle should be in a clear area of about a 25-foot radius of the RT antenna.

Direction:
For RT being checked, starting with 75.00 MHz, do the substeps (a through e) for each frequency listed on work sheet.

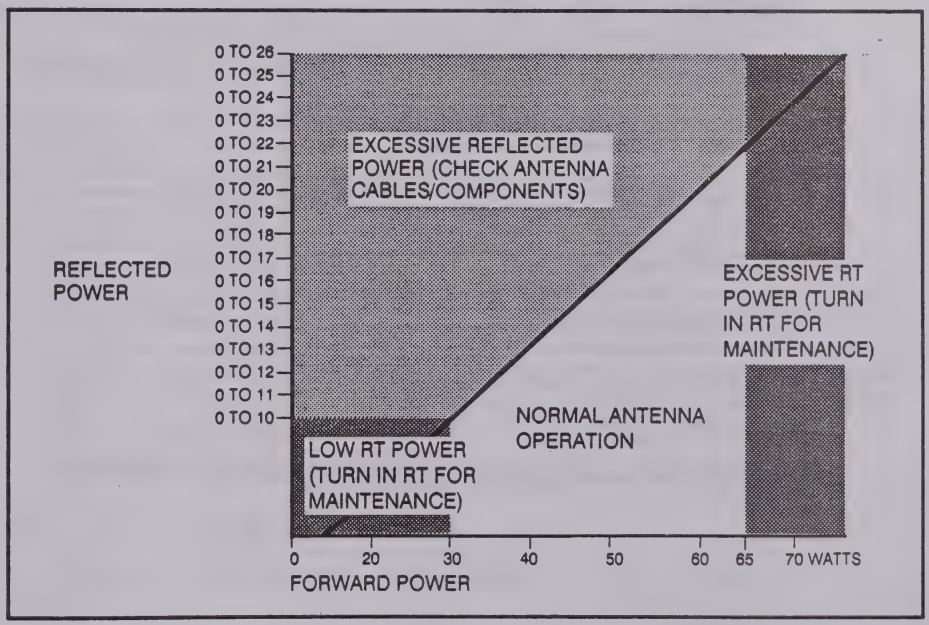
CAUTION

DO NOT CHANGE RT TUNING WHEN RT IS KEYED.

a. As RT frequency is changed, listen for matching unit switching.	a. MX switching sound is heard when RT MC setting is changed.
b. Turn AN/PRM-34 MODE switch to FWD PWR. Key RT; then press down AN/PRM-34 PUSH TO TEST. (On work sheet, next to the appropriate listed frequency, record the AN/PRM-34 reading at substep a.) Release PUSH TO TEST.	b. AN/PRM-34 indicates (displays) between 30 and and 65 watts. EXAMPLE: 75.00 MHz 40 / FWD Regardless of reading, complete substeps c, d and e below.
c. Turn AN/PRM-34 MODE switch to RVS PWR. Key RT; then press AN/PRM-34 PUSH TO TEST. (On work sheet, next to appropriate listed frequency, record the AN/PRM-34 reading at substep b.) Release PUSH TO TEST, and unkey RT.	c. AN/PRM-34 indicates (displays) no more than one-third of FWD PWR reading. EXAMPLE: 75:00 MHz a. 40 FWD b. 13.3 RVS

Step 14.	d. Turn AN/PRM-34 MODE switch to FREQ. Key RT; allow 3-second warm-up, then press down AN/PRM-34 PUSH TO TEST. (on work sheet next to appropriate listed frequency, record the AN/PRM-34 reading at substep c.) Release PUSH TO TEST, and unkey RT.	d. AN/PRM-34 indicates (displays) the RT dial frequency setting plus or minus (±) 4 kHz EXAMPLE: 35.60 MHz not less than 35.596 not less than 35.604 If result is more than 4 kHz off dial frequency, RT being checked is defective.
	e. One at a time, tune RT being checked to other nine frequency settings listed on work sheet. At each frequency, repeat substeps a through d above and complete work sheet as directed.	e. For each frequency setting, indications are the same as substeps a through d.

TRANSMITTED FORWARD-RVS-REFLECTED POWER CHART (RT POWER SWITCH AT HIGH)



ADDITIONAL DA FORM 2404

EQUIPMENT INSPECTION AND MAINTENANCE WORKSHEET

For use of this form see TM 38 750 the proponent agency is the Office of the Deputy Chief of Staff for Logistics.

1 ORGANIZATION (RT SERIAL NO)			2 NOMENCLATURE AND MODEL	
3 REGISTRATION/SERIAL NSN	4a MILES	b (RT MODEL NO (e.g. RT-524, RT-246))	5 DATE	6 TYPE INSPECTION
7				

TM NUMBER	TM DATE	TM NUMBER	

COLUMN a — Enter TM item number.

COLUMN b — Enter the applicable condition status symbol.

COLUMN c — Enter deficiencies and shortcomings.

COLUMN d — Show corrective action for deficiency or shortcoming listed in Column c.

COLUMN e — Individual ascertaining completed corrective action initial in this column.

STATUS SYMBOLS

"X" — Indicates a deficiency in the equipment that places it in an inoperable status.

CIRCLED "X" — Indicates a deficiency, however, the equipment may be operated under specific limitations as directed by higher authority or as prescribed locally, until corrective action can be accomplished.

HORIZONTAL DASH "(-)" — Indicates that a required inspection, component replacement, maintenance operation or test flight is due but has not been accomplished or overdue MWO has not been accomplished.

DIAGONAL "(/)" — Indicates a material defect other than a deficiency which must be corrected to increase deficiency or to make the item completely serviceable.

LAST NAME INITIAL IN BLACK, BLUE-BLACK INK, OR PENCIL Indicates that a completely satisfactory condition exists.

FOR AIRCRAFT Status symbols will be recorded in red.

SAMPLE

ALL INSPECTIONS AND EQUIPM... ...NDITIONS RECORDED ON THIS FORM HAVE BEEN DETERMINED IN ACCORDANCE WITH DIAGNOS... ...C PROCEDURES AND STANDARDS IN THE TM CITED HEREON.

8a. SIGNATURE (Person(s) performing inspection)	8b. TIME	9a. SIGNATURE (Maintenance Supervisor)	9b. TIME	10. MANHOURS REQUIRED

TM ITEM NO a	STATUS b	DEFICIENCIES AND SHORTCOMINGS c	CORRECTIVE ACTION d	INITIAL WHEN CORRECTED e
1.	75.00	a.____ b.____ FWD RVS c.____ MHz	6. 31.45 a.____ b.____ FWD RVS c.____ MHz	
2.	67.05	a.____ b.____ FWD RVS c.____ MHz	7. 35.50 a.____ b.____ FWD RVS c.____ MHz	
3.	62.20	a.____ b.____ FWD RVS c.____ MHz	8. 39.65 a.____ b.____ FWD RVS c.____ MHz	
4.	58.25	a.____ b.____ FWD RVS c.____ MHz	9. 44.80 a.____ b.____ FWD RVS c.____ MHz	
5.	54.40	a.____ b.____ FWD RVS c.____ MHz	10. 50.85 a.____ b.____ FWD RVS c.____ MHz	

DA FORM 1 APR 79 2404 Replaces edition of 1 Jan 64 which will be used

Step 15	LOW-LEVEL RF TRANSMIT POWER	
	Setup: 1. Turn POWER switch of RT being checked to LOW. 2. Turn AN/PRM-34 MODE switch to FWD PWR.	
	a. Key RT; then press down AN/PRM-34 PUSH TO TEST. (Unkey RT before going on.)	a. AN/PRM-34 indicates (displays 0.5 to 10 watts. If indication is incorrect, RT being checked is defective.
	b. Change RT BAND switch to other position. Key RT; then press down AN/PRM-34 PUSH TO TEST. (Unkey RT before going on.)	b. Indication is the same as substep a.
HOW TO PROCEED. Go to block G.		
G. RT MODULATION AND SIDETONE CHECKS Do these checks for either RT-246 or RT-524.		
Step 16	150-Hz SIDETONE AND MODULATION	
	Setup: POWER switch of RT being checked should be a LOW.	
	Key RT; while keyed, turn RT SQUELCH switch through all four positions. Listen to earphone. (Unkey RT before going on.)	150-Hz sidetone is heard in earphone for all SQUELCH positions except OLD ON. (Adjust RT VOLUME as required.) If sidetone is not heard, RT being checked is defective.
Step 17	VOICE SIDETONE AND MODULATION	
	Key RT, and initiate a radio check. (Unkey RT before going on.)	Voice sidetone is heard in earphone. (Adjust RT VOLUME as required.) If sidetone is not heard, RT being checked is defective.
HOW TO PROCEED: If radio system is an AN/VRC-48, -47, -44, or -12, go to block I. If radio system is an AN/VRC-45 or -43, go to block K.		

H. ADDITIONAL RADIO COMPONENT REMOTE INPUT POWER CONTROL CHECK

Do this check for all radio systems that have two or more radio components.

Step 18 REMOTE INPUT POWER CONTROL

NOTE

If for substep b an additional radio component DIAL lamp lights, the link of that additional component mounting is probably in direct. Check with your supervisor for direction.

a. Turn "A" RT POWER switch to OFF	a. "A" RT DIAL lamp goes off. If "A" RT DIAL lamp remains on, "A" RT is defective.
b. Turn all additional radio components POWER switches to ON. (Not "A" RT.)	b. Additional radio components dial lamps do not light. If an additional radio component DIAL lamp lights, the link in that component mount is probably in direct.
c. Turn "A" RT POWER switch to LOW.	c. "A" RT and additional radio component's dial lamps light.

HOW TO PROCEED. Go to block I.

I. R-442 CHECKS

Do these checks for all radio systems that have R-442s. When the radio system is an AN/VRC-44 or -48, first do these checks for "B" receiver and then, as directed later, do them again for the "C" receiver.

Step 19	RECEIVER ANTENNA	
	Setup: 1. Turn "A" RT and all R-442 POWER switches to OFF. 2. Connect receiver antenna to AN/PRM-34 and RT as shown in Figure 3. 3. Turn AN/PRM-34 MODE switch to FWD PWR. 4. Turn "A" RT POWER switch to HIGH (allow 2-minute warm-up). 5. Tune "A" RT to 62.20 MHz.	
	a. Key "A" RT; then press down AN/PRM-34 PUSH TO TEST. (Unkey RT and release AN/PRM-34.)	a. AN/PRM-34 indicates between 30 and 65 watts.
	b. Turn AN/PRM-34 MODE switch TO RVS PWR. Key "A" RT; then press down AN/PRM-34 PUSH TO TEST. (Unkey RT and release AN/PRM-34 PUSH TO TEST button before going on.)	b. AN/PRM-34 indicates (displays) no more than one-third of the FWD PWR reading.
Step 20	AUDIO OUTPUT	
	Setup: 1. Turn "A" RT POWER switch to OFF. 2. Connect AN/PRM-34 to R-442 being checked as shown in Figure 2. 3. Turn AN/PRM-34 MODe switch to SENS SQ. 4. Controls of R-442 being checked should be preset according to instructions on page 2. 5. Connect audio accessory to AUDIO jack of R-442 being checked. 6. Set POWER switch of R-442 being checked to ON-RESET. (If required to turn R-442 on, turn "A" RT POWER switch to LOW.)	
	Turn R-442 VOLUME control fully clockwise (CW); then counter-clockwise (CCW) to midpoint.	In earphone and speaker (if used): Rushing noise loudness increases; at full volume rushing noise is loud. As VOLUME control is turned CCW, rushing noise loudness decreases.

Step 21	SQUELCH CONTROL AND CALL LAMP		
	Rotate R-442 SQUELCH switch through all four positions.	a. b. c.	OFF positions: Loud rushing noise is heard. ON positions: Rushing noise is quieted (eliminated). CALL lamp: Remains OFF for all positions. If indications are incorrect, R-442 being checked is defective.
Step 22	RECEIVER SENSITIVITY (RECEPTION)		
	Setup: Turn AN/PRM-34 MODE switch to SENS SQ. Direction: For R-442 being checked, starting with 50.00 MHz, do the below listed substeps (a, b, and c) for each frequency listed below. Frequency setting: 1. 50.00, 2. 45.00, 3. 40.00, 4. 35.00, 5. 30.00, (change BAND switch setting), 6. 55.00, 7. 60.00, 8. 65.00, 9. 70.00 and 10. 75.00.		
	a. Turn R-442 SQUELCH switch to OLD OFF; then press down and release AN/PRM-34 PUSH TO TALK several times.	a.	When AN/PRM-34 PUSH TO TEST is pressed, rushing noise is quieted and a tone is heard at audio accessory. When AN/PRM-34 PUSH TO TEST is released, rushing noise is heard. If indications are incorrect, R-442 being checked is defective.
	b. Turn R-442 SQUELCH switch to NEW OFF; then press down and release AN/PRM-34 PUSH TO TEST several times.	b.	Indications are the same as substep a.
	c. One at time, tune R-442 (in 55-MHz steps) to other nine frequency settings listed. At each setting, repeat substeps a and b.	c.	For each frequency setting, indications are the same as substeps a and b.

Step 23	SQUELCH SENSITIVITY	
	Setup: 1. Tune R-442 being checked to 75.00 MHz. 2. AN/PRM-34 MODE switch should be set at SENS SQ.	
	a. Turn R-442 SQUELCH switch to NEW ON; then press down and release AN/PRM-34 PUSH TO TEST several times.	a. When AN/PRM-34 PUSH TO TEST is pressed, CALL lamp lights; a tone is heard. When AN/PRM-34 PUSH TO TEST is released, CALL lamp is goes off and a very short burst of rushing noise is heard. If indications are incorrect, R-442 being checked is defective.
	b. Turn R-442 SQUELCH switch to OLD ON; Then press down and release AN/PRM-34 PUSH TO TEST several times.	b. Indications are the same as substep a.

HOW TO PROCEED. When the radio system being checked is an:
AN/VRC-44 or -48 where "C" receiver has not been checked, check "C" receiver starting with step 19 of block I.
An/VRC-12, -47 or -44 -48 whose "C" receiver has been checked, with:
No R-442 speakers, go to block K.
R-442 speakers, go to block J.

J. R-442 SPEAKER MUTING CHECK

Do this check for all radio systems with R-442 speaker.

Step 24	SPEAKER MUTING
	Setup: 1. Connect a speaker (LS-454/U) to an AUDIO jack of each R-442. 2. Tune all R-442s to 75.00 MHz. 3. Turn all R-442 SQUELCH switches to OFF. (Verify rushing noise of all R-442 speakers.) 4. Turn all R-442 VOLUME controls, from off, one-quarter turn clockwise. 5. An audio accessory that has a push-to-talk switch should be connected to the audio jack of J-3513. 6. "A" RT should be tuned to 62.20 MHz.

Step 24 (Cont)	Key RT. (Press/release PTT switch several times.) (Unkey before going on.)	When RT is keyed, rushing noise from R-442 speaker(s) is greatly reduced. When RT unkeys, R-442 rushing noise from speaker(s) returns to preset level.
HOW TO PROCEED. Go to block K.		
K. TSEC/KY-57 OPERATION WITH RT Do these checks for all radio systems.		
Step 25	TSEC/KY-57 INPUT POWER	
	Setup: 1. Adjust RT VOLUME control to MIDRANGE. 2. Tune RT MC-TUNE-KC to authorized frequency. 3. Turn RT SPEAKER switch to OFF. 4. Set RT SQUELCH switch to NEW ON. 5. Turn TSEC/KY-57 MODE switch to CIPHER text (C). 6. Set TSEC/KY-57 FILL switch to position 1. 7. Set TSEC/KY-57 VOLUME control to MIDRANGE.	
	a. Turn POWER/TIME DELAY switch to ON. b. Key and unkey handset.	a. RT CALL lamp lights, and are heard in handset. b. RT CALL lamp goes OFF and beeping stops (ALARM CLEARS).

Step 26 LOADING TSEC/KY-57 USING KYK-13/TSEC
Do these checks for all RTs.

CAUTION

WHEN CONNECTING KYK-13/TSEC to the TSEC/KY-57, the MODE switch of the KYK-13/TSEC should be set at OFF.

Setup:
1. Connect KYK-13/TSEC to TSEC/KY-57 using the FILL cable.
2. Set KYK-13/TSEC FILL switch to position containing VARIABLE to be transferred.
3. Set TSEC/KY-57 FILL switch to position to be filled.

a. Turn MODE switch of TSEC/KY-57 to LOAD (LD)	1. TSEC/KY-57 position NOT FILLED: Constant tone in handset; RT CALL lamp lights. 2. TSEC/KY-57 position FILLED: Beep and burst of rush noise heard in handset. RT CALL lamp flashes. If indication in 1 and 2 are incorrect, TSEC/KY-57 is defective.
b. Turn KYK-13/TSEC MODE switch to ON. Key and unkey handset.	1. TSEC/KY-57 position NOT FILLED: Constant tone stops; beep is heard in handset; RT CALL lamp goes off; KYK-13/TSEC PARITY lamp flashes. 2. TSEC/KY-57 position FILLED: Two beeps and burst of rush noise heard in handset; RT CALL lamp and KYK-13/TSEC PARITY lamp both flash. If indications are incorrect, TSEC/KY-57 is defective.
c. Turn TSEC/KY-57 MODE switch to CIPHER (C) and KYK-13/TSEC MODe switch to OFF. Key handset. (Unkey handset before going on.)	c. Beep is heard in handset and RT CALL lamp flashes. If indications are incorrect, KYK-13/TSEC is defective.

Step 26 (Cont)	d. Repeat setups and steps a through c for each FILL position of TSEC/KY-57.	d. Indication(s) are the same as a through c above.

HOW TO PROCEED:
1. If radio system is an AN/VRC-12, -44, -47, or -48, go to block L.
2. If radio system is an AN/VRC-43 or -46, go to block M.

L. TSEC/KY-57 OPERATION WITH R-442
Do these checks for all R-442s.

Step 27 TSEC/KY-57 INPUT POWER.

Setup:
1. Adjust receive VOLUME control to desired level.
2. Tune Receive MC-TUNE-KC to authorized frequency.
3. Turn Receiver SQUELCH switch to NEW ON.
4. Turn TSEC/KY-57 MODE switch to cipher text (C).
5. Set TSEC/KY-57 FILL switch to position 1.
6. Set TSEC/KY-57 VOLUME control to MIDRANGE.

a. Turn OFF, ON, TD switch to ON.	a. Receiver CALL lamp lights, and beeping sound is heard at speaker.
b. Push and release the initiate button on the J-3514.	b. Receiver CALL lamp goes off, and beeping stops. (Alarm clears).

Step 28 LOADING TSEC/KY-57 USING KYK-13/TSEC.
Do these checks for all R-442s.

CAUTION

WHEN CONNECTING KYK-13/TSEC TO TSEC/KY-57, THE MODE SWITCH OF THE KYK-13/TSEC SHOULD BE TURNED TO OFF.

Setups:
1. Connect KYK-13/TSEC to TSEC/KY-57 using FILL cable.
2. Set KYK-13/TSEC FILL switch to the position containing the VARIABLE to be transferred.
3. Set TSEC/KY-57 FILL switch to the position to be filled.

a. Turn MODE switch of TSEC/KY-57 to LOAD (LD).	1. TSEC/KY-57 position NOT FILLED: Constant tone heard in loud speaker or handset; R-442 CALL lamp lights. 2. TSEC/KY-57 position FILLED: Beep and burst of rush noise heard in loudspeaker or handset; R-442 CALL lamp flashes. If indications are incorrect, TSEC/KY-57 is defective.
b. Turn KYK-13/TSEC MODE switch to ON. Press and release the station button on J-3514.	1. TSEC/KY-57 position NOT FILLED: Constant tone stops and beep is heard in loudspeaker or handset; R-442 CALL lamp goes OFF and KYK-13/TSEC PARITY lamp flashes. 2. TSEC/KY-57 position FILLED: Two beeps and a burst of rush noise heard in loudspeaker or handset; R-442 CALL lamp and KYK-13/TSEC PARITY lamp both flash. If indications are incorrect, TSEC/KY-57 is defective.

Step 28 (Cont)	c. Turn TSEC/KY-57 MODE switch to CIPHER (C) and KYK-13/TSEC MODE switch to OFF. Press and release substation button on J-3514.	c. Beep heard in loudspeaker or handset; R-442 CALL lamp flashes. If indications are incorrect, KYK-13/TSEC is defective.
	d. Repeat setups and steps a through c for each FILL position of the TSEC/KY-57.	d. Indications are the same as a through c above.

HOW TO PROCEED: Go to block M.

M. RADIO SYSTEM DISTANCE CHECK IN CIPHER

Do these checks for all systems.

Step 29 RT DISTANCE CHECK

CAUTION

WHEN DISCONNECTING KYK-13/TSEC FROM THE TSEC/KY-57, THE MODE SWITCH OF THE KYK-13/TSEC SHOULD BE SET TO OFF.

Setup:
1. Disconnect KYK-13/TSEC form the TSEC/KY-57.
2. Set TSEC/KY-57 FILL switch to position FILLED.
3. Set RT SPEAKER switch to ON.
4. Set RT SQUELCH switch to NEW ON.

Establish communication with another station located a prescribed distance away by using the same variable. (A simple radio check will do.)	Distant station operator responds.

Step 30 R-442 RECEIVER DISTANCE CHECK WITH TSEC/KY-57

CAUTION

WHEN DISCONNECTING KYK-13/TSEC FROM THE TSEC/KY-57, THE MODE SWITCH OF THE KYK-13/TSEC SHOULD BE SET TO OFF.

Setup:
1. Disconnect KYK-13/TSEC from the TSEC/KY-57.
2. Set TSEC/KY-57 FILL switch to position FILLED.

Establish communications with another station located a prescribed distance away, using the same variable. (A simple radio check)	Distant station operator responds.

HOW TO PROCEED: Go to block N.

N. SHUTDOWN OF RADIO SYSTEM.		
Do these checks for all systems		
Step 31	SHUTDOWN OF COMMUNICATIONS SYSTEM	
	a. Turn RT TSEC/KY-57 FILL switch to Z 1-5 and back to position 1; then for each FILL position 1; through 5, key and unkey the handset.	a. For each position 1 through 5, a constant tone is heard when handset is keyed. If indication is incorrect, TSEC/KY-57 is defective.
	b. Turn TSEC/KY-57 FILL switch to Z ALL position and then back to position 6 and key and unkey handset.	b. Indications are the same as a above.
	c. Turn TSEC/KY-57 OFF ON TD switch to OFF, and key handset. (Unkey handset before going on.)	c. No tone heard from handset. If indication is incorrect, TSEC/KY-57 is defective.
	d. Turn RT POWER switch to OFF.	d. RT unit DIAL light goes off. If indication is incorrect, RT unit is defective.
	e. Turn R-442 TSEC/KY-57 FILL switch to Z 1-5 and back to position 1; then for each FILL position 1 through 5, press and release J-3514/V initiate button.	e. For each position 1 through 5 a constant tone is heard from handset or speaker when initiate button is pressed. If indication is incorrect, TSEC/KY-57 is defective.
	f. Turn TSEC/KY-57 FILL switch to Z ALL position and than back to position 6 and press and release J-3514/V initiate button.	f. Indications are the same as e above.

Step 31 (Cont)	g. Turn TSEC/KY-57 OFF ON TD switch to OFF, and press J-3514/V initiate button. (Release initiate button before going on.)	g. No tone heard from handset or speaker. If indication is incorrect, TSEC/KY-57 is defective.
	h. Turn R-442 POWER ON-RESET switch to OFF.	h. R-442 DIAL light goes off. If indication is incorrect, R-442 is defective.

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STUDENT SUBCOURSE CONTENT INQUIRY FORM

(TRADOC Reg 350-33)

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FILL IN YOUR NAME AND COMPLETE MAILING ADDRESS BELOW AND ON REVERSE SIDE.

LAST, FIRST, MI	RANK	SOCIAL SECURITY NUMBER *SEE PRIVACY ACT STATEMENT AT BOTTOM OF THIS PAGE

SUBCOURSE TITLE	SUBCOURSE NUMBER	EDITION
SYSTEM TROUBLESHOOT TO CORRECTIVE ACTION AN/VRC-12 SERIES RADIO SET WITH COMSEC EQUIPMENT, PART I	FS 0725	9

ADDRESS FAILURE TO SUBMIT YOUR CORRECT COMPLETE MAILING ADDRESS WILL PREVENT EXPEDITIOUS HANDLING OF YOUR INQUIRY	PHONE NUMBER
ZIP CODE	COMMERCIAL AV

So that we can spend more time researching your inquiry ... and less time handling your inquiry form, check your inquiry area(s).

LESSON OR EXAM IN ERROR WITH —

☐ Field Manual Procedure ☐ Doctrine

☐ Technical Manual Procedure ☐ Equipment Specification

CONFUSING CONTENT

☐ Example ☐ Organization ☐ Wording ☐ Situation

☐ Illustration ☐ Chart ☐ Figure ☐ Table

OTHER ☐

COMMENTS:

Please use this area to write your inquiry and feel free to add comments on a separate sheet of paper if necessary. Be specific and cite paragraphs, pages and/or figure numbers.

SCHOOL REPLY:

PRIVACY ACT STATEMENT

AUTHORITY:	10USC3012(B) and (G)
PURPOSE:	To provide Army Correspondence Course Program students a means to submit inquiries and comments.
ROUTINE USES:	To locate and make necessary changes to student records
DISCLOSURE:	VOLUNTARY. Failure to submit SSN will prevent subcourse authors at service schools from accessing student records and responding to inquiries requiring such follow-up

NOTE: FOLD THIS INQUIRY SHEET WITH THE ARMY CORRESPONDENCE COURSE PROGRAM ADDRESS ON THE OUTSIDE, TAPE IT CLOSED, AND MAIL WITHOUT AN ENVELOPE.

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So that we can spend more time researching your inquiry ... and less time handling your inquiry form, check your inquiry area(s).

REQUEST FOR —

- ☐ Disenrollment
- ☐ Enrollment Extension
- ☐ Subcourse Reissue

CHANGE IN —

- ☐ Address
- ☐ Unit
- ☐ Rank or Grade

PROBLEMS WITH

- ☐ Exam Response Sheet
- ☐ Enrollment
- ☐ Incorrect SSN
- ☐ Incorrect Rye Date

OTHER ☐

COMMENTS:

Please use this area to write your inquiry and feel free to add comments on a separate sheet of paper if necessary.

IPD REPLY:

PRIVACY ACT STATEMENT

AUTHORITY: 10USC3012(B) and (G)

PURPOSE: To provide Army Correspondence Course Program students a means to submit inquiries and comments.

ROUTINE USES: To locate and make necessary changes to student records.

DISCLOSURE: VOLUNTARY. Failure to submit SSN will prevent subcourse authors at service schools from accessing student records and responding to inquiries requiring such follow-up.

NOTE: FOLD THIS INQUIRY SHEET WITH THE ARMY CORRESPONDENCE COURSE PROGRAM ADDRESS ON THE OUTSIDE, **TAPE** IT CLOSED, AND MAIL WITHOUT AN ENVELOPE.

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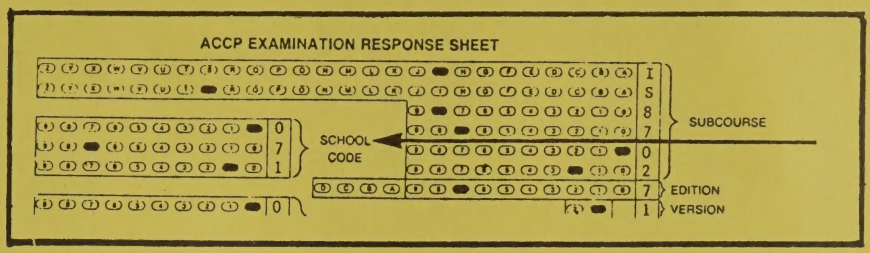

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301	Intel (Huachuca)	
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SUBCOURSE
FS 0725

EDITION
9